THE ARCHITECTURAL FORUM

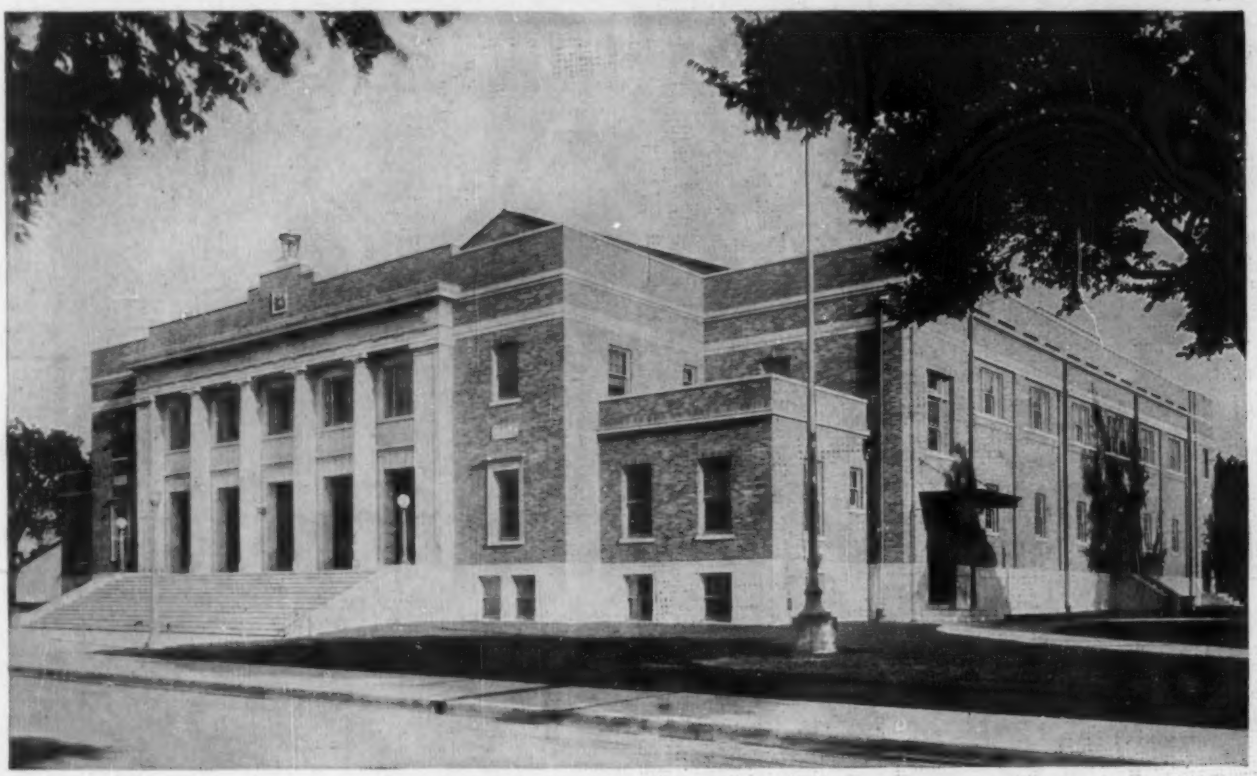
IN TWO PARTS

PART ONE

ARCHITECTURAL DESIGN

JULY

1928



A. C. Michaelis
Architect

MEMORIAL HALL, JOPLIN, MISSOURI

Greenwell Construction
Company, *Builders*

Architecture
Wahr.

THE ARCHITECTURAL FORUM

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B

*Illustrated. ex.—exterior. in.—interior. pl.—plan.

*Illustrated. ex.—exterior. in.—interior. pl.—plan.

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*Illustrated. ex.—exterior. in.—interior. pl.—plan.

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*Illustrated. ex.—exterior. in.—interior. pl.—plan.

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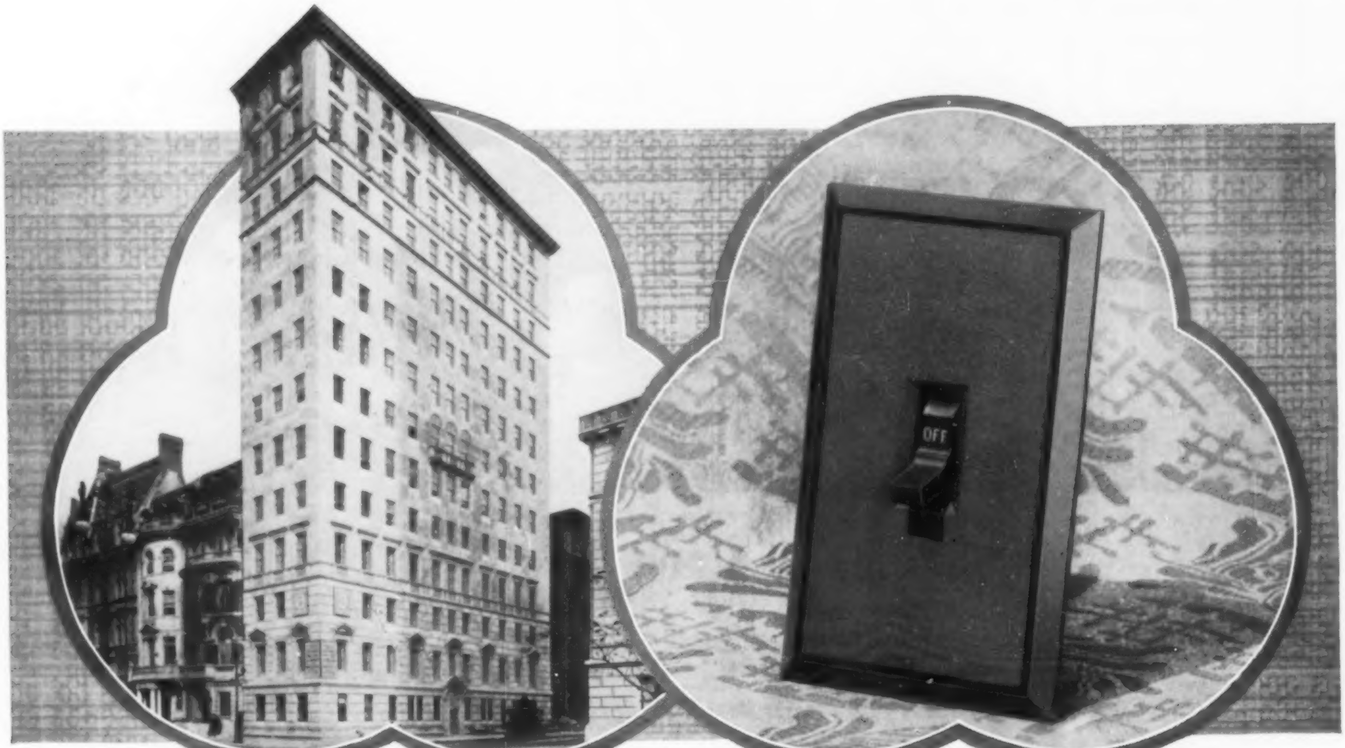
Published Monthly by

ROGERS & MANSON COMPANY

383 Madison Avenue, New York

Howard Myers, Pres.; James A. Rice, Vice-Pres.; Paul W. Hayes, Vice-Pres.; Robert Sweet, Sec. and Treas.
Yearly Subscription, Payable in Advance, U.S.A., Insular Possessions and Cuba, $7.00. Canada, $8.00. Foreign Countries in the Postal Union, $9.00
Single Copies: Quarterly Reference Numbers, $3.00; Regular Issues, $1.00. All Copies Mailed Flat
Trade Supplied by American News Company and its Branches. Entered as Second Class Matter at the Post Office at New York, N. Y.



Cooperative Apartment on Fifth Avenue, New York, equipped with Bakelite Molded Switch Plates, R. Candelia, Architect

THE EDITOR'S FORUM

THE DEATH OF MR. MEAD

ANNOUNCEMENT is made of the death in Paris, on June 20, of William Rutherford Mead, the last surviving original member of the firm of McKim, Mead and White. The son of Larkin Goldsmith and Mary Jane Noyes Mead, William Rutherford Mead, was born in Brattleboro, Vt., on August 20, 1846. He was graduated from the Brattleboro High School and entered Norwich University in 1861 remaining there until 1863. In 1909 that University gave him the degree of Master of Sciences. In the fall of 1863 he entered Amherst College being graduated with the degree of A. B. in 1867. He received the honorary degree of LL.D. from Amherst in 1902. After leaving college, Mr. Mead began the study of architecture in the New York office of the late Russell Sturgis in 1868. In 1871 he went to Florence and continued his studies in architecture there for a year, afterward spending six months in travel in other European countries. In 1872 Mr. Mead began the practice of his profession here with the late Charles F. McKim. Stanford White became associated with them in 1878.

Since the deaths of Mr. McKim and Mr. White, Mr. Mead had continued to practice under the old firm name in association with partners who grew up with the firm and were admitted to partnership while Mr. McKim and Mr. White were still living. The firm has designed many of the most notable structures in the country, among them being the Agricultural and New York State Buildings at the World's Columbian Exposition at Chicago in 1893; the Boston Public Library; Rhode Island State Capitol; the old Madison Square Garden; and the Columbia Library and other buildings of that university; also the library and other structures at the College of the City of New York; the University of Virginia, the University, Century, Metropolitan, Harvard, and Racquet and Tennis Club of New York; the War College at Washington and the reconstruction of the White House; the General Post Office in New York; the Municipal Building; the Pennsylvania Station; Bellevue Hospital; Brooklyn Institute of Arts and Sciences; additions to the Metropolitan Museum of Art; Madison Square Presbyterian Church; Bank of Montreal; Knickerbocker Trust Company; and the National City Bank.

NEW YORKER ON FINE ARTS BOARD

Ezra Winter, of New York, was recently appointed by President Coolidge to be a member of the Commission of Fine Arts. This Commission determines upon art of federal buildings in Washington.

RESTORATIONS AT SULGRAVE

WHEN American visitors to Sulgrave Manor this year inspect the ancestral home of George Washington, they will find that an entire wing, known to have been pulled down in the eighteenth century, has been reconstructed. Thus Sulgrave Manor has progressed one step further in the restoration of its former condition, and the ancient house, which carries the history of the Washington family back to the days of King Henry VIII, is beginning to look as it did when the Washingtons moved to Virginia, according to *The New York Times*.

"With the partial restoration at the hands of the Sulgrave Institution several years ago, the fine old sixteenth century mansion seemed architecturally incomplete. Last year it was decided that the missing wing should be rebuilt in scrupulous harmony with the rest of the building. The architect chosen was Sir Reginald Blomfield, whose reconstruction of Regent Street in London has helped to stamp him as a leader of his profession. In preparing the plans for Sulgrave Manor, Sir Reginald tried to visualize the building as the Washington family left it. The result is that externally the new wing is so in keeping with the opposite wing of the house that it has the appearance of sturdy old age.

"The stone for the wing was cut in the neighborhood of Sulgrave, weather-worn rock being selected wherever possible. The roof is of stone slates, which have the picturesque, dulled color of age. Creeping plants and vines grow up over the new wing, concealing any difference between the parts.

"But it is the surrounding country-side even more than the house itself which breathes the placid, gentle beauty of old England. Behind the south garden stretches an orchard with apple trees all in the glorious bloom of an English Spring. If one looks across the yew hedge-row and smooth green lawn with its border of flowers which will soon be blooming, one can see the gracious old mansion standing in the plain dignity in which it stood centuries ago. A modern blue-slated barn which sprawled across the picture until a few weeks ago has been torn down, so there is now nothing to spoil the illusion or to mar the simple, old world setting.

"The expense of the restoration has been collected from individual members of the Colonial Dames of America, supplemented by admission fees to the manor house. Last year more than 10,000 persons, mostly Americans, visited the historic house. It is hoped that from the same sources money will come to complete the restoration of the seventeenth century rooms, until recently used by the caretaker."

THE PHILADELPHIA MUSEUM OF ART

CHARLES L. BORIE, JR., CLARENCE C. ZANTZINGER
AND HORACE TRUMBAUER, ARCHITECTS

From a Litho-Pencil Rendering by Herbert Pullinger

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER ONE

JULY 1928

THE PHILADELPHIA MUSEUM OF ART

CHARLES L. BORIE, JR., CLARENCE C. ZANTZINGER and
HORACE TRUMBAUER, ASSOCIATED ARCHITECTS

BY

HAROLD D. EBERLEIN

THE Philadelphia Museum of Art, in Fairmount Park, must be considered from three points of view if we wish to understand it in its true significance. These three points of view, though distinct in themselves, are all closely related each to the others. In the first place, the building invites examination as a work of architecture. Next, it claims our regard as an important and indeed a pivotal factor in a remarkable program of regenerative city planning. Finally, representing as it does the last word in museum arrangement, it requires more than merely passing notice on the score of convenience.

As an architectural achievement, it should be plainly said at the outset that the three associated architects,—Charles L. Borie, Jr., Clarence C. Zantzinger, and Horace Trumbauer—make no claim whatever to originality in either the conception or the realization of what has been performed. And, if we seek for evidence of that quality, we shall not find it. After all, it is quite possible to question whether any great degree of originality is especially to be desired in a building of this sort. The absolute fundamentality of Greek classicism for a museum has something to be said in its favor. In some way we have come to associate with it a certain universal propriety, just as French is recognized as the common language of diplomacy. The Greek mode is safe, dignified and restful, whatever else it may or may not be. In employing it one is saved the risk of experimental uncertainty. It is altogether a known quantity. Thanks to its general acceptance as the embodiment of quiet simplicity and perennial decorum, a Greek building affords a setting for the diversity of exhibits brought together within its walls,—a setting if not warmly sympathetic, at least charitable and unobtrusive. Again, for a building whose structure and purpose constitute a source of æsthetic and financial concern to an enormous community with inevitably divergent tastes, it may be questioned whether a type of design less generally accepted as a standard of fitness would have been altogether justifiable. Furthermore, in a case where three associated architects were involved, a classic Greek expression was the only form upon which they could unanimously agree as the proper style.

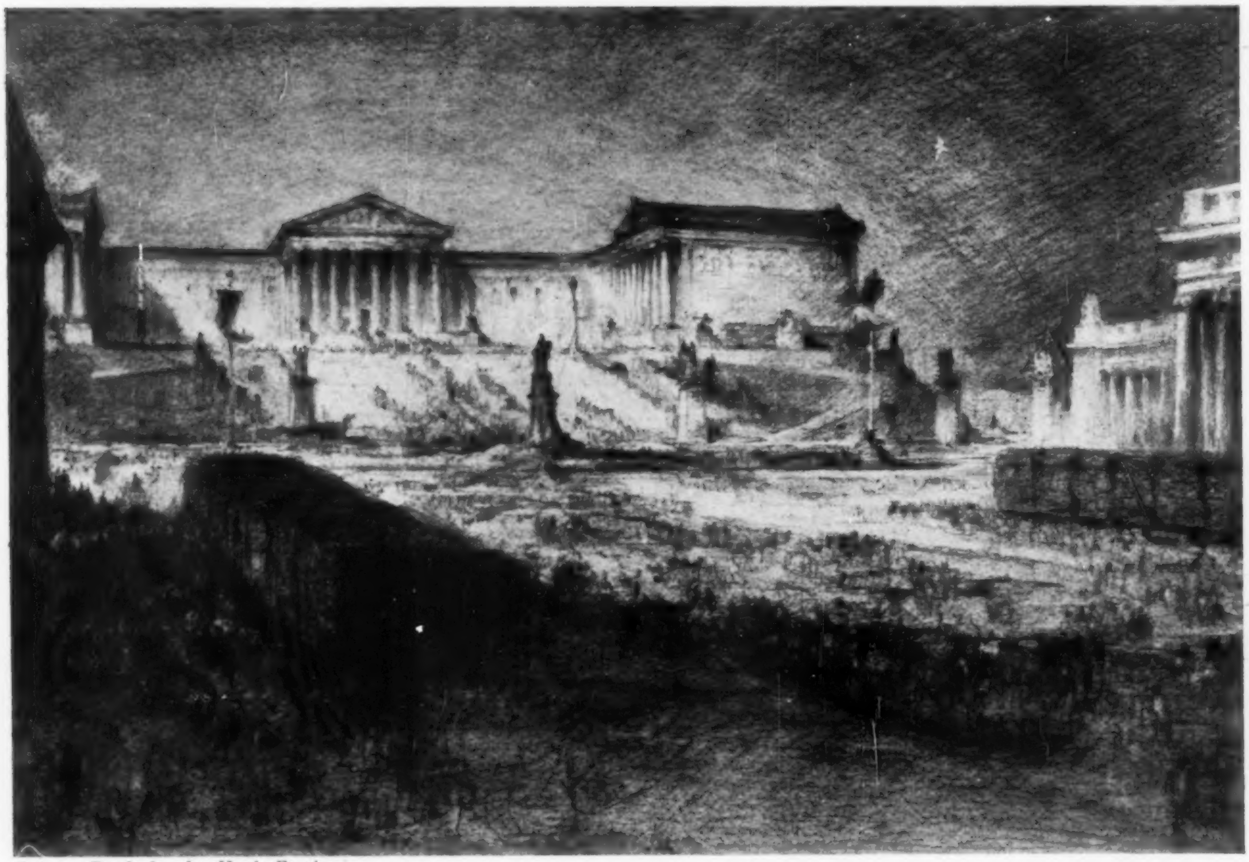
The ideal that actuated the architects in this instance finds its explanation in a passage from J. D. Beazley's translation of Ernst Pfuhl's "Masterpieces of Greek Drawing and Painting". From the west coast of Asia Minor, the land of Homer, to the Golden Gate of San Francisco, and away to Sydney and Wellington; from the immigration of the Greeks into their historical homes to the present day, four thousand years of history and a single culture unite the peoples of the West. The roots of their thought and their motion are in Hellas, where European humanity manifested itself for the first time, and with incomparable clarity, purity, and beauty, in home and state, in art and poetry, in thought and science. Wherever Europeans have settled and great communities have expressed themselves in monumental buildings, there we find Greek columns and pediments, Greek orders and mouldings. These are something more than a historical symbol; for even where the architect has been but partially conscious of the forms which he has employed, something of the magic of Hellas lingers in these late descendants of Greek architecture. In architecture and the figurative arts, as in philosophy and poetry, the Greeks turned all they touched into forms of crystalline clearness, whose beauty was the natural expression of their intrinsic necessity. Their works of architecture and of political and philosophical thought, no less than their poetical and artistic creations, are permeated with organic life. . . . Greek humanity and Greek mastery of form laid the foundation of a luster which no subsequent period, however great its achievements, has equaled; for the luster is the light of pure youth."

Profound respect for our legacy of Greek culture, and recognition of Greek forms as a part of our common heritage, need no apology for their expression in tangible form. Though the building of the Philadelphia Museum of Art be denied the appeal of originality, it is an outstanding example of archæological achievement. The propriety of an archæological presentation once determined, the architects spared no effort to make their work as archæologically perfect as possible, regardless of the labor and research entailed. In the matter of refinements and

Photos. Courtesy of the Pennsylvania Museum

Entrance Door into Main Stair Hall

subtleties practiced by the Greek builders for the purpose of correcting optical illusions and mitigating the starkness of absolutely straight lines and right angles, the greatest care was exercised to conform to the best traditions of antiquity. This adherence to Greek precedent is one of the most unusual features of the building. It was a labor of love with Professor Goodyear to check the drawings for the Museum, with the aim of making it agree in its refinements with the refinements of the Parthenon as recorded by him. Subtleties and variations from absolutely linear rectitude, which it was often impossible to indicate even on large scale drawings, were taken care of in the course of actual superintendence. The walls of the pedimented ends for the central pavilion and wings are slightly convex, and the column centers of their porticoes, along with the entablatures, follow the same nearly imperceptible curve; the intermediate walls of the wings are concaved and given a slight batter; the roof peaks are convex, as are likewise the steps of both approach and main entrance; the long horizontal lines of the stylobate and cornice are slightly convexed upward, while there is a comparable convexity in the horizontal across the base of the pediment; and endless similar corrections were made so that the finished structure might realize that ideal of "elasticity and vigor of aspect,—an elusive and surprising beauty impossible to describe and not to be explained by



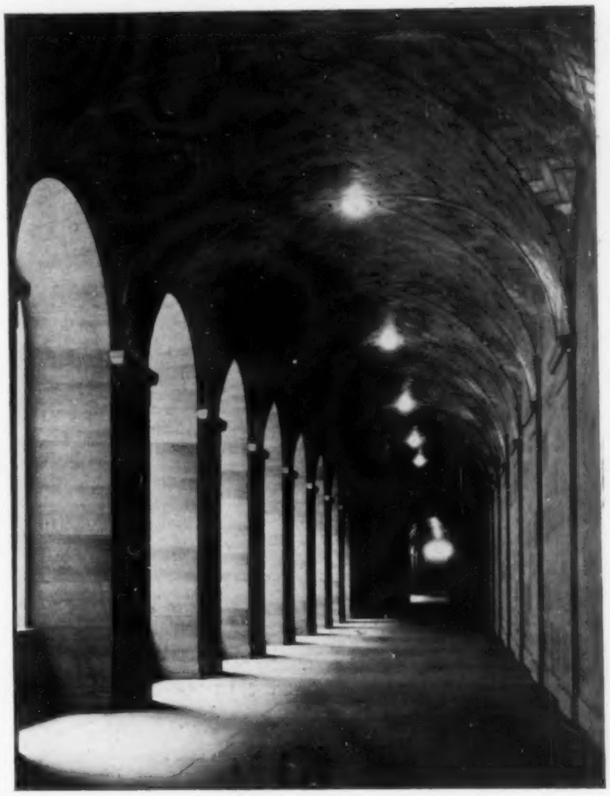
From a Rendering by Hugh Ferriss

The Philadelphia Museum of Art

Charles L. Borie, Jr., Clarence C. Zantzinger and Horace Trumbauer, Associated, Architects

the mere composition and general proportions, yet manifest to every cultivated eye." It is only fair to add that the solicitude shown during the course of erection has been justified in the outcome.

The one feature of the Museum most likely to excite widespread interest and comment is the use of color on the outside. The Minnesota Mankato and Kasota stone, of which the Museum is built, has itself a warm, glowing, tawny hue of a very distinct character, approximating a ground color often used by the Greeks to cover the whole exterior of a marble or stuccoed building. The glazed roof tiles give a varied mass of blue ranging from turquoise to indigo. Many would let it go at that. The mere mention of exterior architectural polychromy is usually enough to send off the disapproving into a volley of prejudiced deprecation. Tradition, almost unbroken since the Renaissance, so they say, has been against it. If the truth be known, there has really been more post-Renaissance external polychromy than they care to recall. The alleged weight of tradition creates a handicap to start with. Claiming the authority of time-honored usage, the anti-colorists are wont to rail at the use of polychrome adornment as a spectacular effort to galvanize dry classicism into the semblance of a living interest fundamentally alien to it. It is a ruse to divert the public eye from poverty-stricken platitudes by dangling before it a bright-hued toy. Dubious neutrals, taking refuge



Vaulted Corridor in the Basement

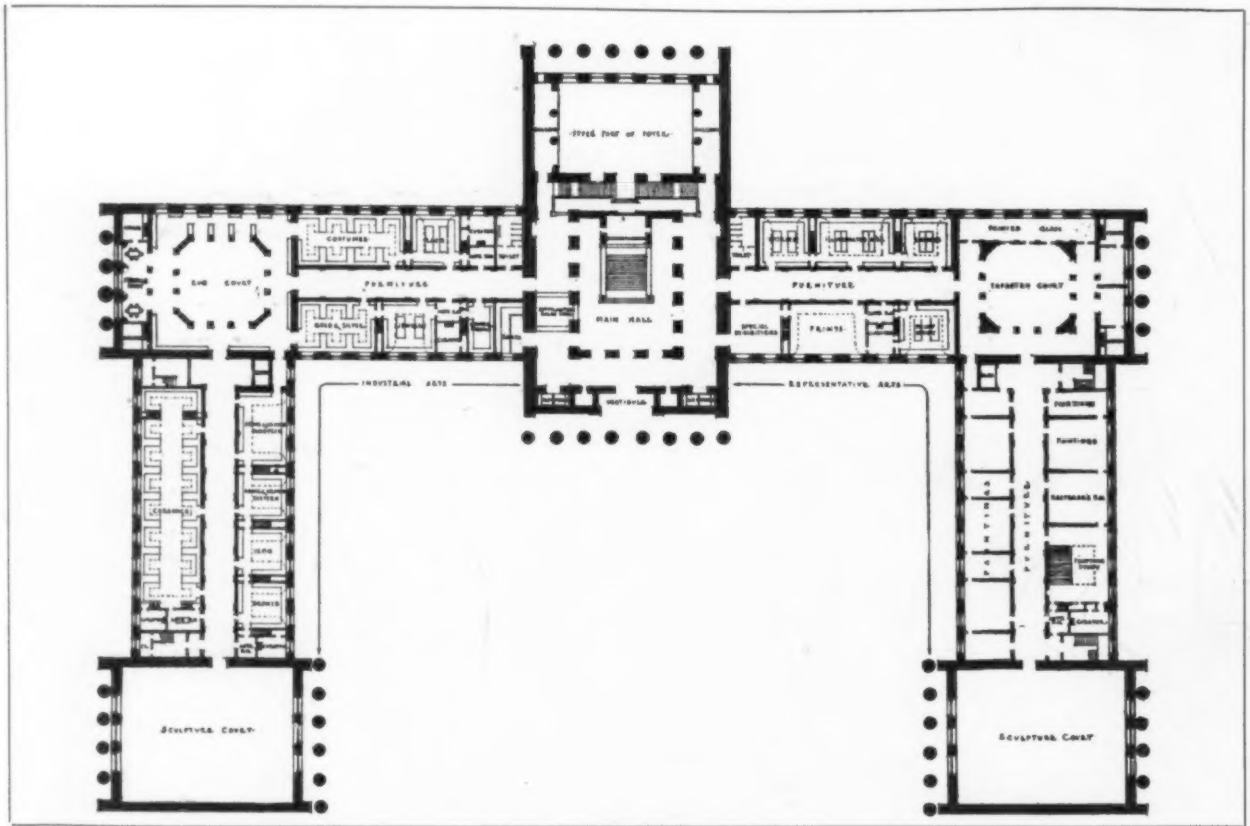
South Front of The Philadelphia Museum of Art from the Parkway

Charles L. Borie, Jr., Clarence C. Zantzinger and Horace Trumbauer, Associated, Architects

Pedimented Motif of Front of the Southwest Pavilion from the Parkway

in a non-committal stand, query the manner of polychrome performance and intimate that most of the modern attempts are ill-conceived. As a matter of fact, use of external polychromy of a very vivid sort was a recognized and effective factor in the aspect of Greek buildings. The relations of color to composition and the proportions of both structural members and incident details constituted a carefully reasoned code. When the architects of the Museum committed themselves to a program of archæology, they very properly included accuracy of color treatment as well as accuracy of form.

Too much credit cannot be given for the thorough research brought to bear in the accomplishment of this task and for the scrupulous fidelity to classic precedent shown throughout. The constant collaboration of Leon V. Solon, who has made the field of exterior polychromy peculiarly his own, has been invaluable; likewise must acknowledgment be made for the whole-hearted coöperation of the sculptors, John Gregory and C. P. Jennewein, who are responsible for the groups in the polychromed portions of the exterior,—the groups in the pediments, the cresting of the roof, the capitals of the columns and pilasters, and sundry other details,—all executed in lustrous glazed terra cotta. Incidentally, it should be mentioned that the physical requirements of the occasion have called forth an entirely new development in manufacturing technique. Brilliant colors were employed, "adaptable to conditions of visibility

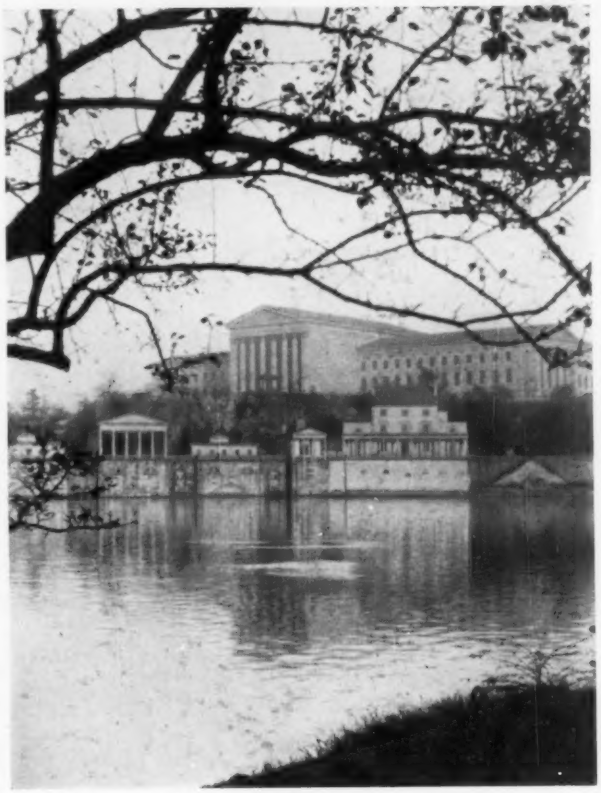


Plan of the First or Study Collection Floor, The Philadelphia Museum of Art

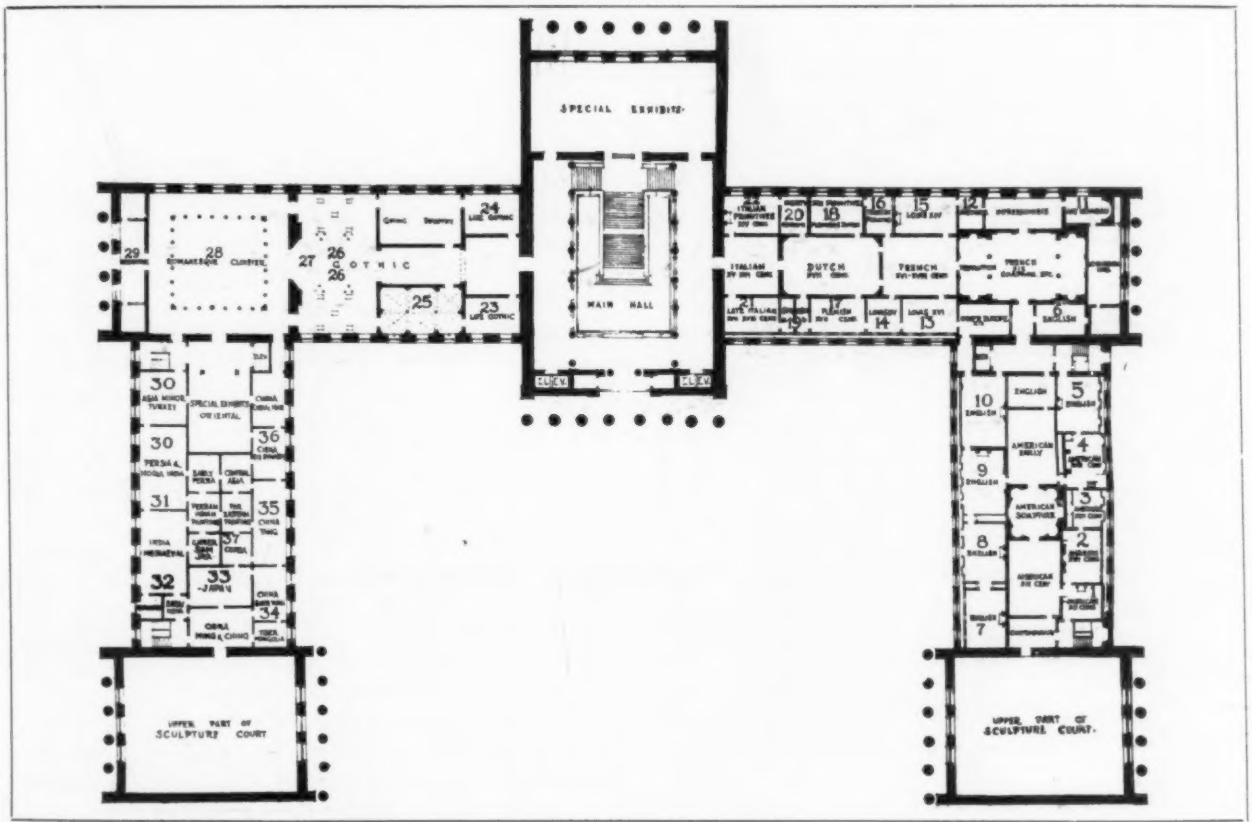
Charles L. Borie, Jr., Clarence C. Zantzinger and Horace Trumbauer, Associated, Architects

at long range,"—scarlet, vermilion, gold, black, buff, blue and green. Many problems in the distribution of color had to be solved. As Mr. Solon writes, "when each group had finally reached a state of development which appeared to leave detail in doubt, it was cast in plaster and shellacked ready for coloring." When the groups were colored they "became as sensitive as a musical instrument, and color was in actuality a dynamic force which could link together or completely separate features in composition." The effects of color were no less pronounced when applied to mouldings, dentils, triglyphs, foliage and other details. The chromatic balance with regard to articulation and accent had to be delicately adjusted. Hearty commendation is due the architects and those who labored with them in realizing an exterior polychrome scheme for a building of classic character more comprehensive than anything that has been attempted since the golden age in Greece. This venture in polychromy marks a signal achievement in the realm of American architecture and is bound to exert a far-reaching influence. It will unquestionably disturb the equanimity of that type of classicists who have cultivated a sense of form only and an obsession for icy, drab austerity.

It is too soon, perhaps, for the general public to arrive at a stable estimate of the value of the Museum. Architectural ideals are in a state of flux and conflict; æsthetic perception is likely to be abnormally sensitive and irritable. Critics, with whose



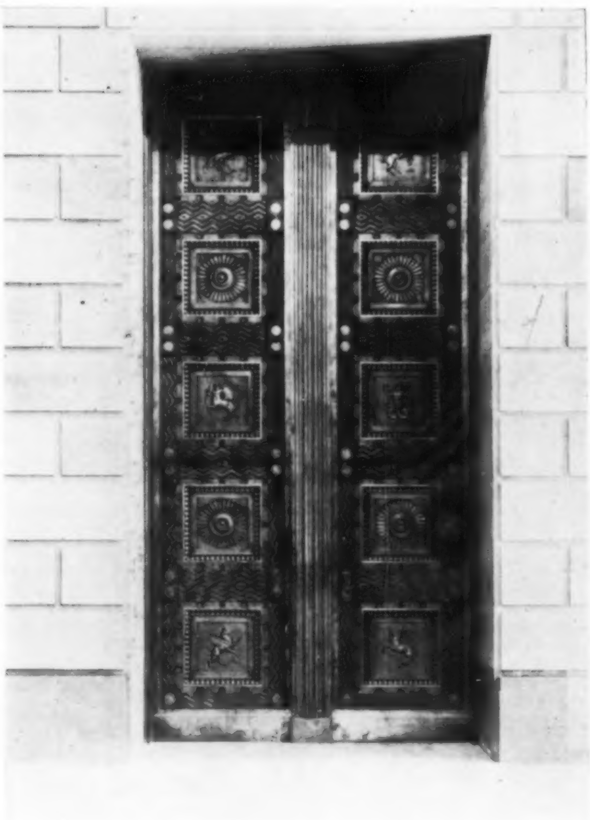
The Museum and Buildings of the Old Water Works from Across the River



Plan of the Second or Principal Exhibition Floor, The Philadelphia Museum of Art

Charles L. Borie, Jr., Clarence C. Zantzinger and Horace Trumbauer, Associated, Architects

One of the Georgian Rooms in The Philadelphia Museum of Art

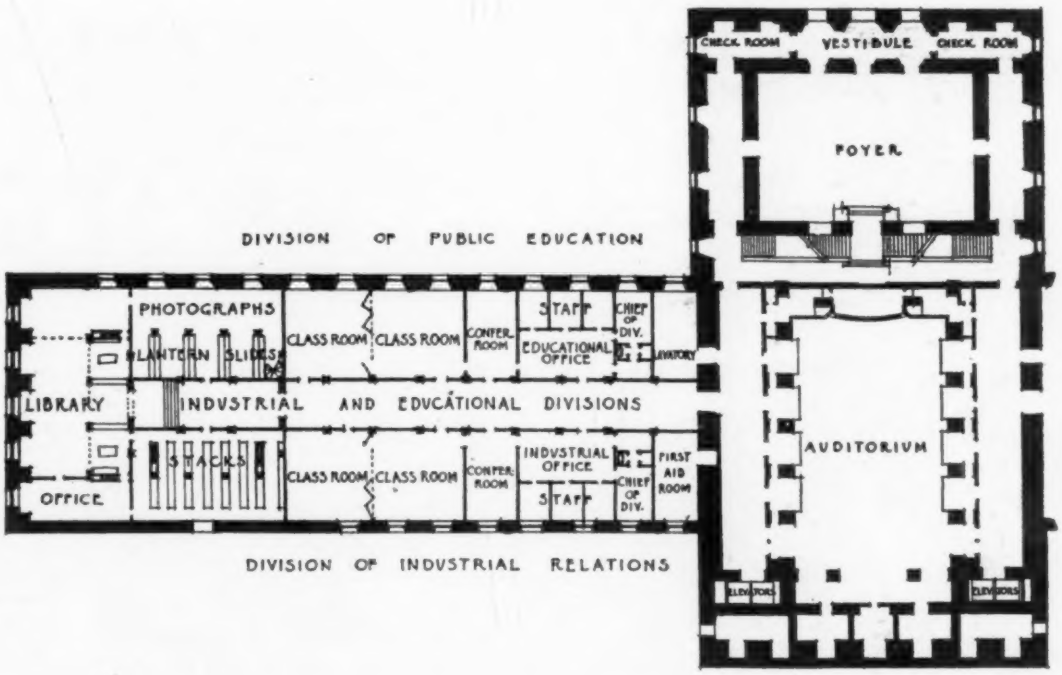


Detail of Bronze Elevator Doors

particular preference some comparatively minor matter does not exactly coincide, are often unduly harsh and disposed to magnify disapproval of a single feature into blanket condemnation. Those opposed to exterior polychromy, by prejudice or conviction, are sometimes so intemperate in their expression of dislike that one is disposed to quote to them in rejoinder Hoffenstein's lines: "There's something wrong with all of us; let's ask the Hippopotamus." At last, when Philadelphia's full scheme of civic reconstruction shall have been realized, the scheme of which the Museum is the pivotal feature, the structure crowning with its ordered serenity the eminence at the end of the Parkway will come into its own. When that day comes, those who have borne the burden of decision in all matters affecting the Museum and the entire program connected with it will have the justification to which they are entitled.

Aside from immediately architectural considerations, the Museum holds the key position in a program of city rearrangement without parallel elsewhere. Years ago, one chilly April morning, Mayor Reyburn took a party of politicians and officials to the top of the old Fairmount reservoir hill and bade them look from there to the City Hall tower. They looked, and saw a mile or more of closely built city blocks traversed by a network of streets running at right angles. The Mayor then broached the project of a museum and art gallery to crown the reservoir hill, and a broad parkway lined with civic buildings

GEORGIAN ROOM FROM TREATY HOUSE, UPMINSTER, NEAR LONDON



Basement Plan, Showing Facilities for Group Discussions, Specialized Services and Public Lectures

THE PHILADELPHIA MUSEUM OF ART

Charles L. Borie, Jr., Clarence C. Zantzinger and Horace Trumbauer, Associated, Architects

running straight as a die from the foot of the hill to the City Hall. This was the initial public step towards realizing the city's hitherto neglected opportunities. The Mayor's proposal dismayed his companions, who could see nothing ahead but utter impossibility: it "wrung shouts of anger and derision from people who presented themselves as spokesmen for the 'unfortunate taxpayers.'" Nevertheless, year by year the dream envisioned by Mayor Reyburn has gradually been coming true. The completion of the Museum, the Parkway, and an appreciable showing of its flanking buildings will inevitably hasten the ultimate rounding out of the entire scheme with its extended boulevards on both banks of the Schuylkill. The torrents of complaint, hostile criticism and narrow-minded spite poured for years upon those who have stood at the forefront of this tremendous project have not changed the steadfast purpose of the program adopted. The President of the Park Commission, roundly abused and charged with "czarism," has been happily oblivious to the maledictions constantly showered upon him and has vindicated the "autocracy," of which he has been accused, by its intelligence and the accomplishment of tasks, confronted with which a more theoretically appropriate democratic course would have proved utterly futile. Thanks to the combination of circumstances, the Museum, now a *fait accompli*, appears as a visible and convincing warrant of what has been done, stands forth as a fitting and dignified terminus of the Parkway vista, and renders imperative the southern extension of the east and west boulevards along the Schuylkill. Its bearing as a central feature in a great civic composition must not be overlooked in the estimate of its significance.

In the arrangement of the Museum's plan, the primary objects were the greatest possible measure of educational utility, and the opportunity for future growth in accordance with a unified, coherent scheme. Since "a living museum has two distinct functions to perform,—to maintain an exhibition gallery and to conduct a school with research laboratories,"—the building "is divided into two main floors,—an exhibition floor and a study collection floor." Below the main exhibition floor is the study collection floor where, by a cross classification with the exhibits on the principal floor above and by unusual facilities for study, the educational usefulness of the Museum is increased; below the study floor, again, there is a floor for the educational departments and for the research laboratories. The arrangement of the main exhibition floor provides for central galleries flanked on each side by a series of period rooms, true in every detail to the times and places from which they have come. In these rooms are exhibited the finest of the contemporary paintings, furniture, and all the appropriate decorative accessories. Among such rooms already installed are a room from the Treaty House, Upminster, near London; eighteenth century rooms from Sutton-Scarsdale and Wrightington Hall, in Derbyshire; the great parlor of the Powel House, Philadelphia; a room from the early nineteenth century Derby House, in Salem; and two early Pennsylvania-German rooms from the Millbach house.

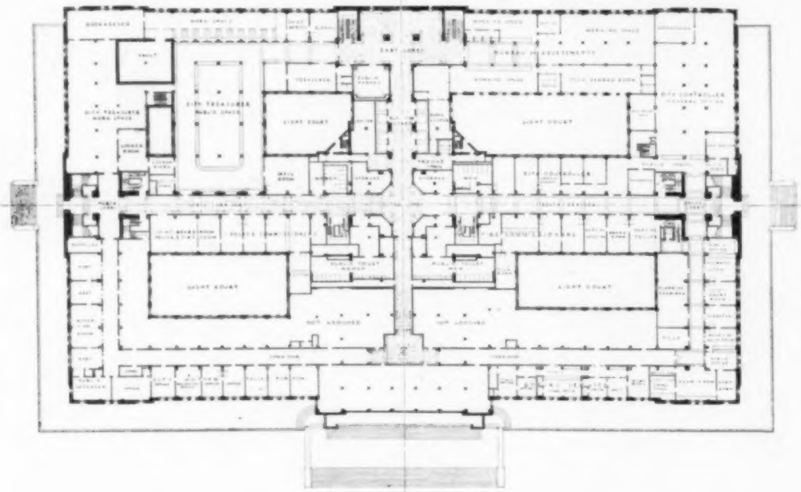
One of the Exhibition Galleries, The Philadelphia Museum of Art

Photos. Miles Berne

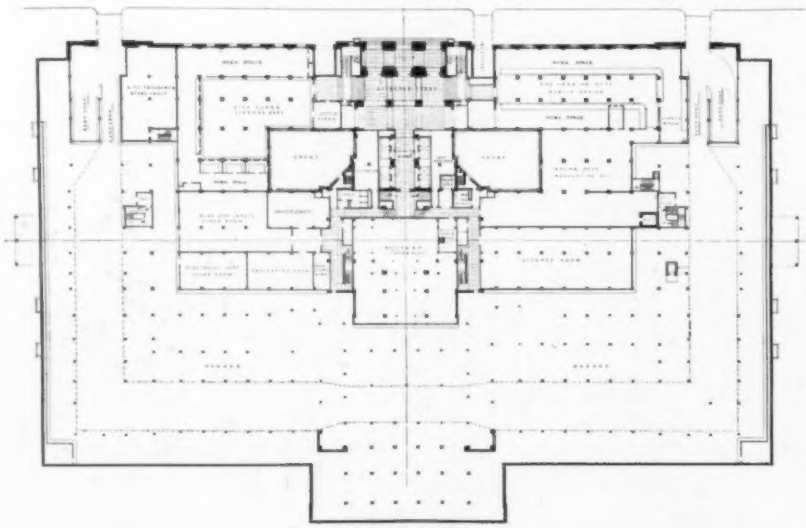
Plans on Back

LOS ANGELES CITY HALL

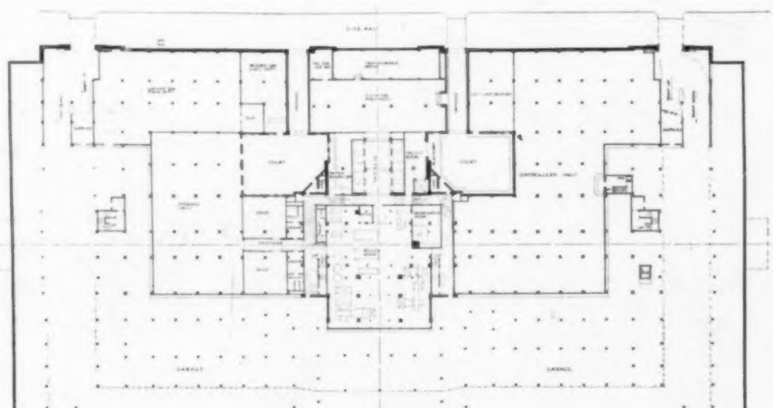
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



GROUND FLOOR



BASEMENT



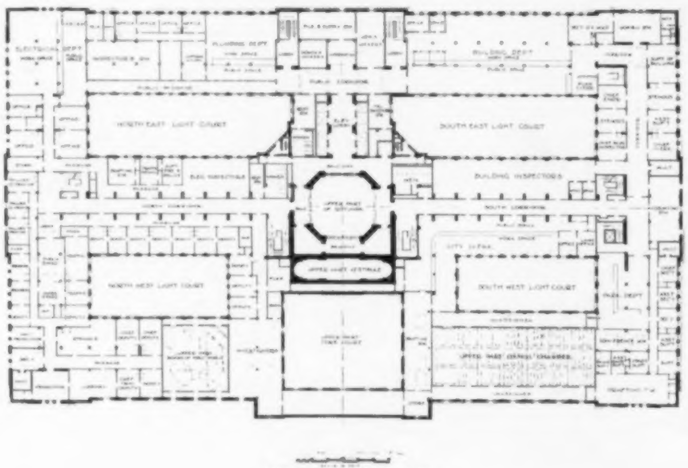
SUB-BASEMENT

PLANS: LOS ANGELES CITY HALL

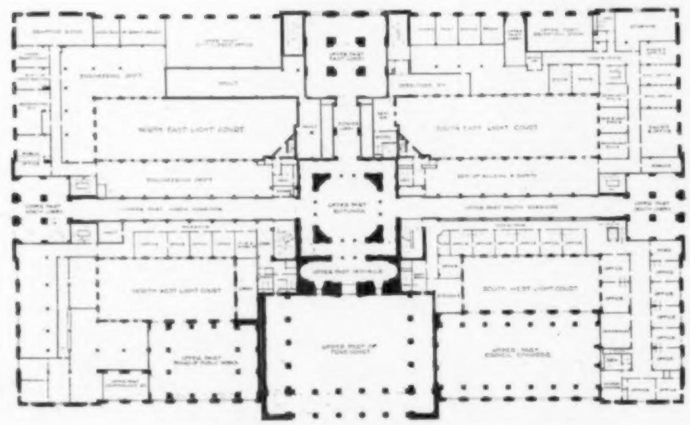
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

Plans on Back

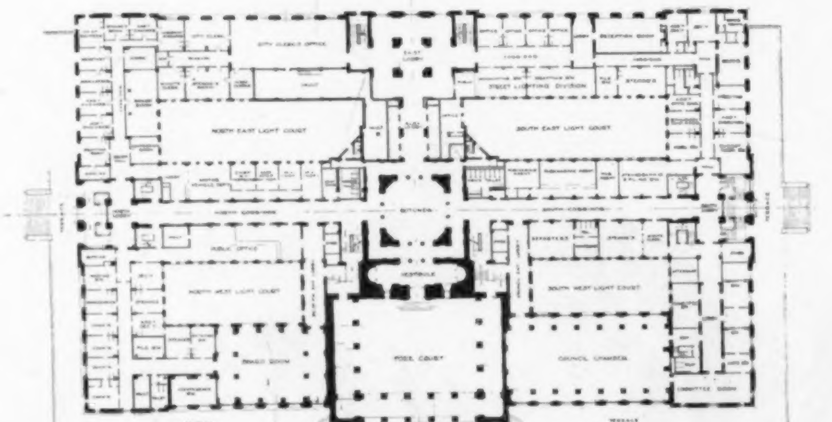
MAIN ENTRANCE TO FORECOURT, LOS ANGELES CITY HALL
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



SECOND FLOOR



MEZZANINE FLOOR



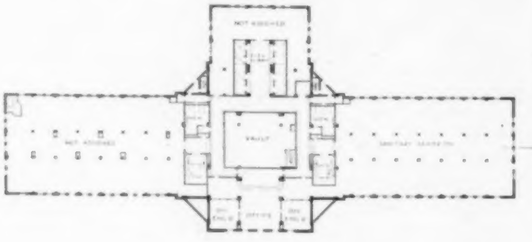
FIRST FLOOR

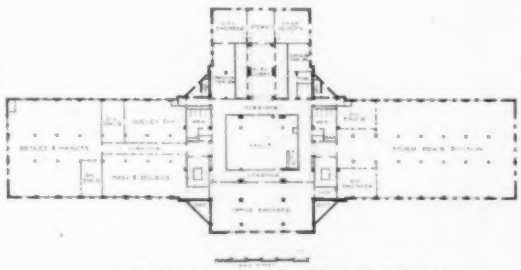
PLANS: LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

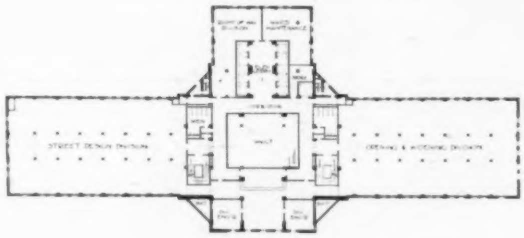
Plans on Back

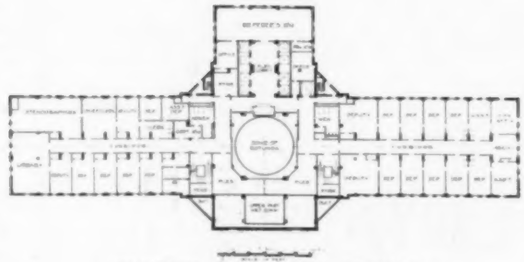
ARCADE IN FORECOURT, LOS ANGELES CITY HALL
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



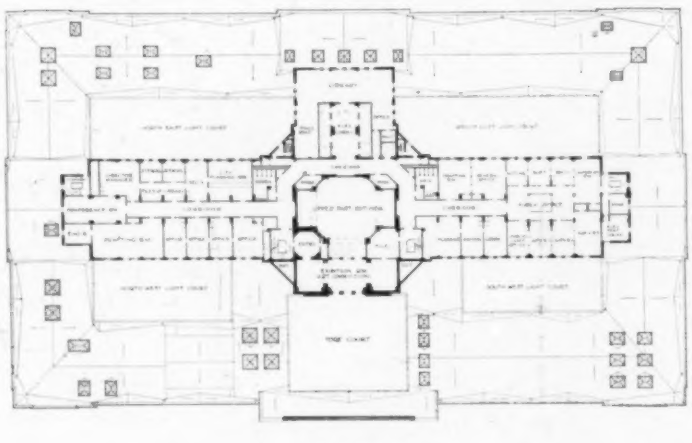


SIXTH AND SEVENTH FLOORS





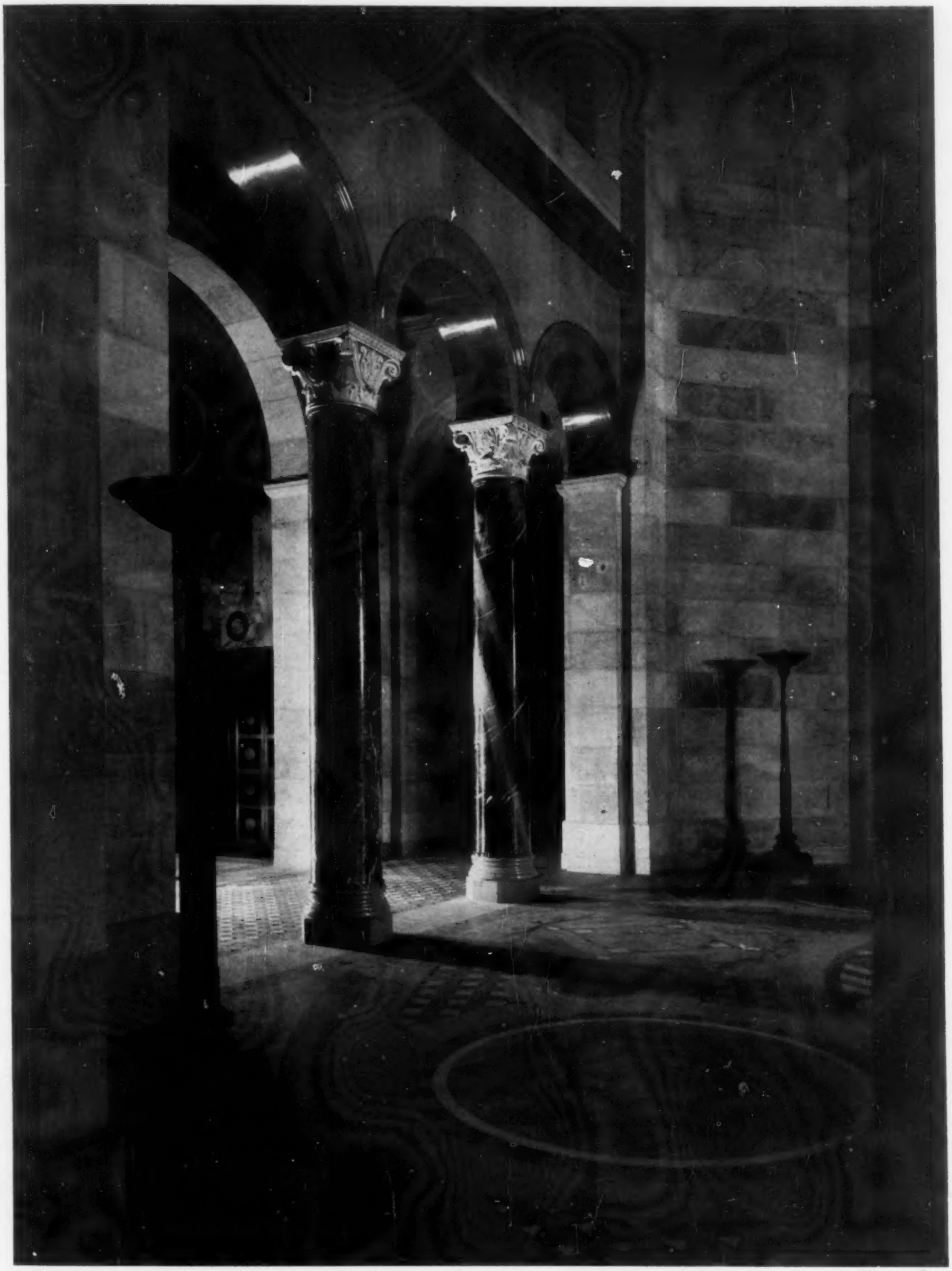
FOURTH AND FIFTH FLOORS



THIRD FLOOR

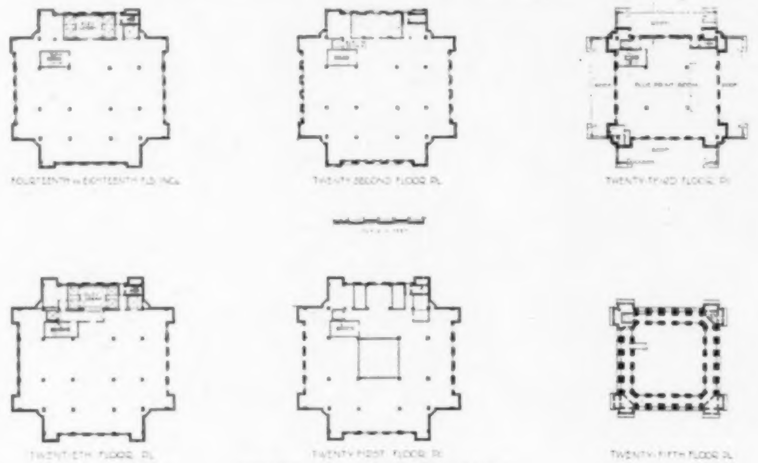
PLANS: LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

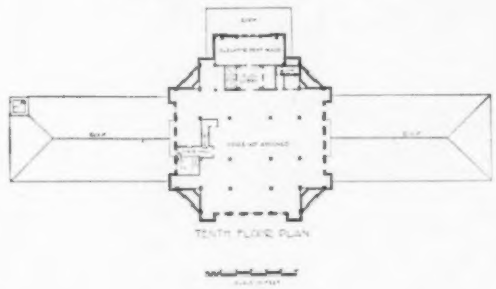


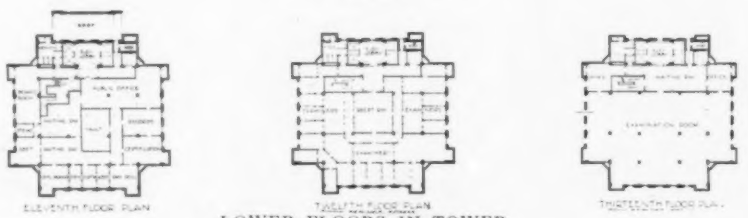
Plans on Back

ENTRANCE FROM ELEVATOR LOBBY INTO ROTUNDA, LOS ANGELES CITY HALL
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

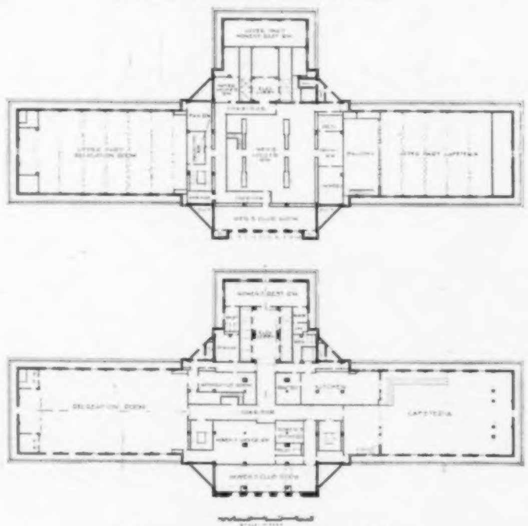


UPPER FLOORS IN TOWER





LOWER FLOORS IN TOWER



EIGHTH AND NINTH FLOORS

PLANS: LOS ANGELES CITY HALL

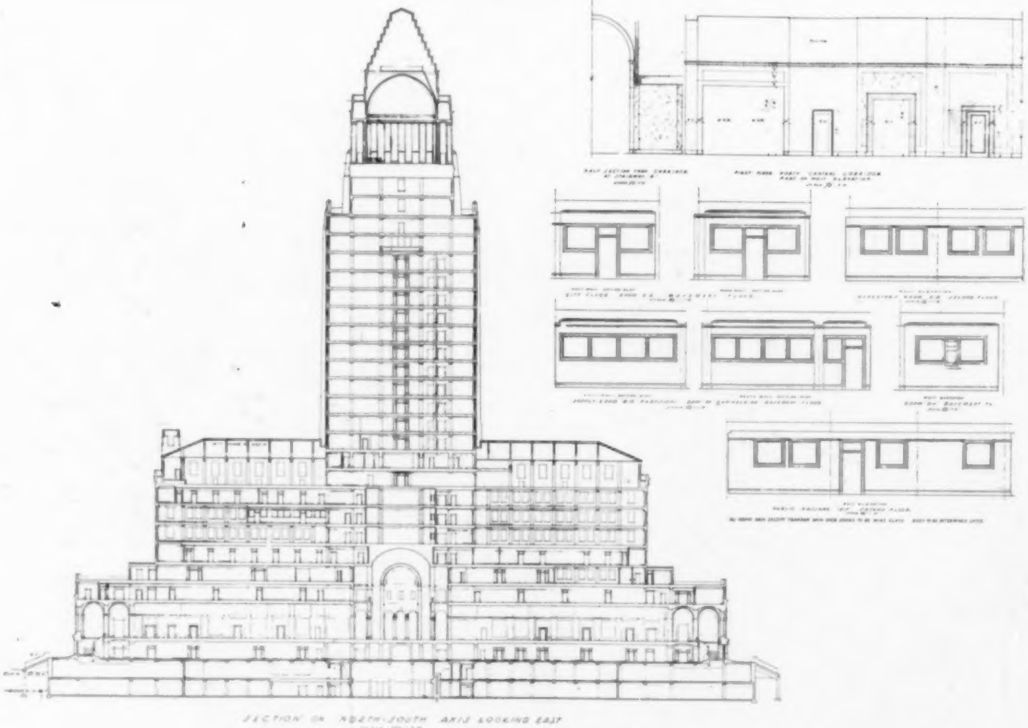
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

Elevations on Back

ELEVATOR LOBBY, FIRST FLOOR, LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

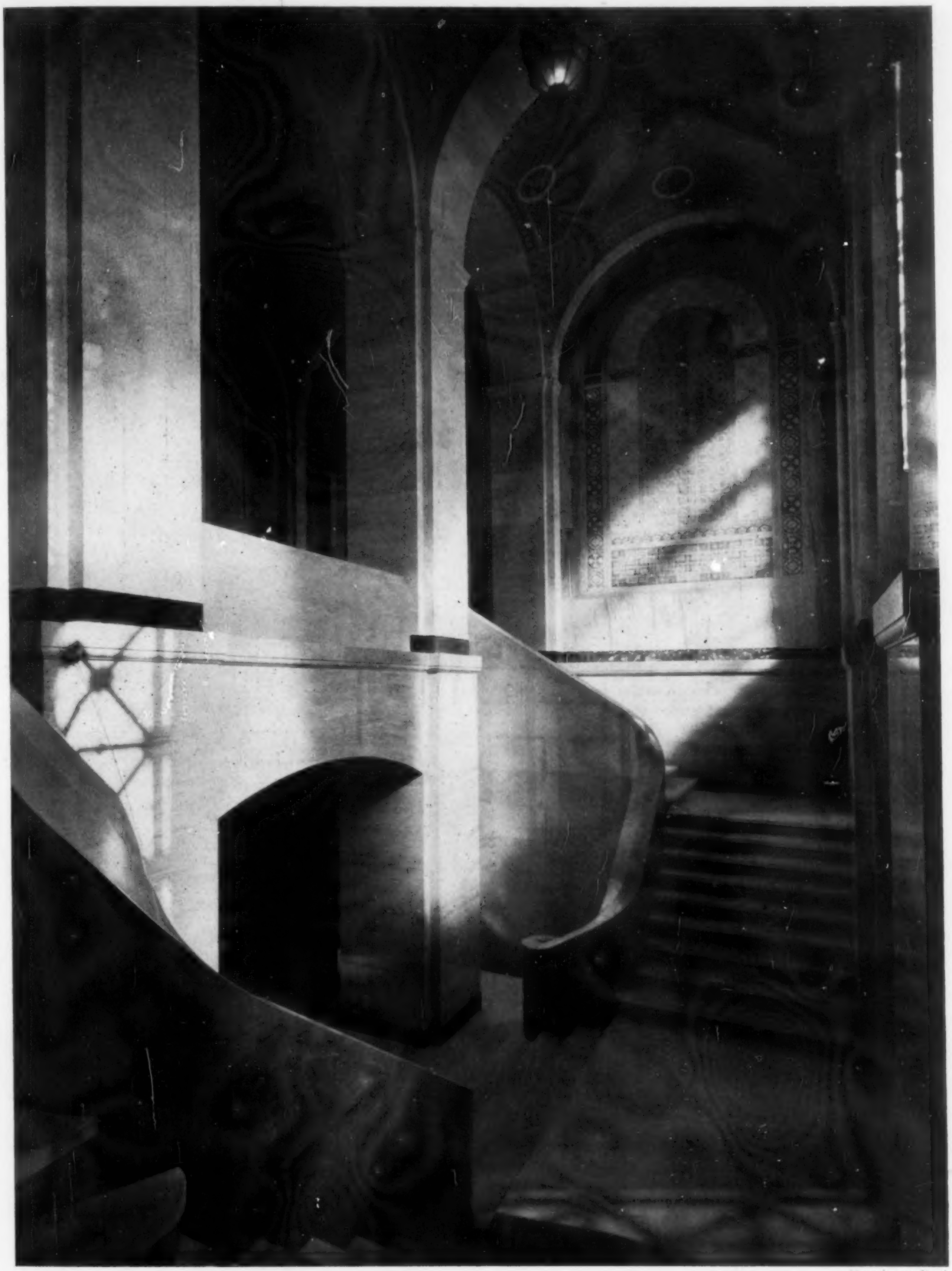
WEST ELEVATION



LONGITUDINAL SECTION

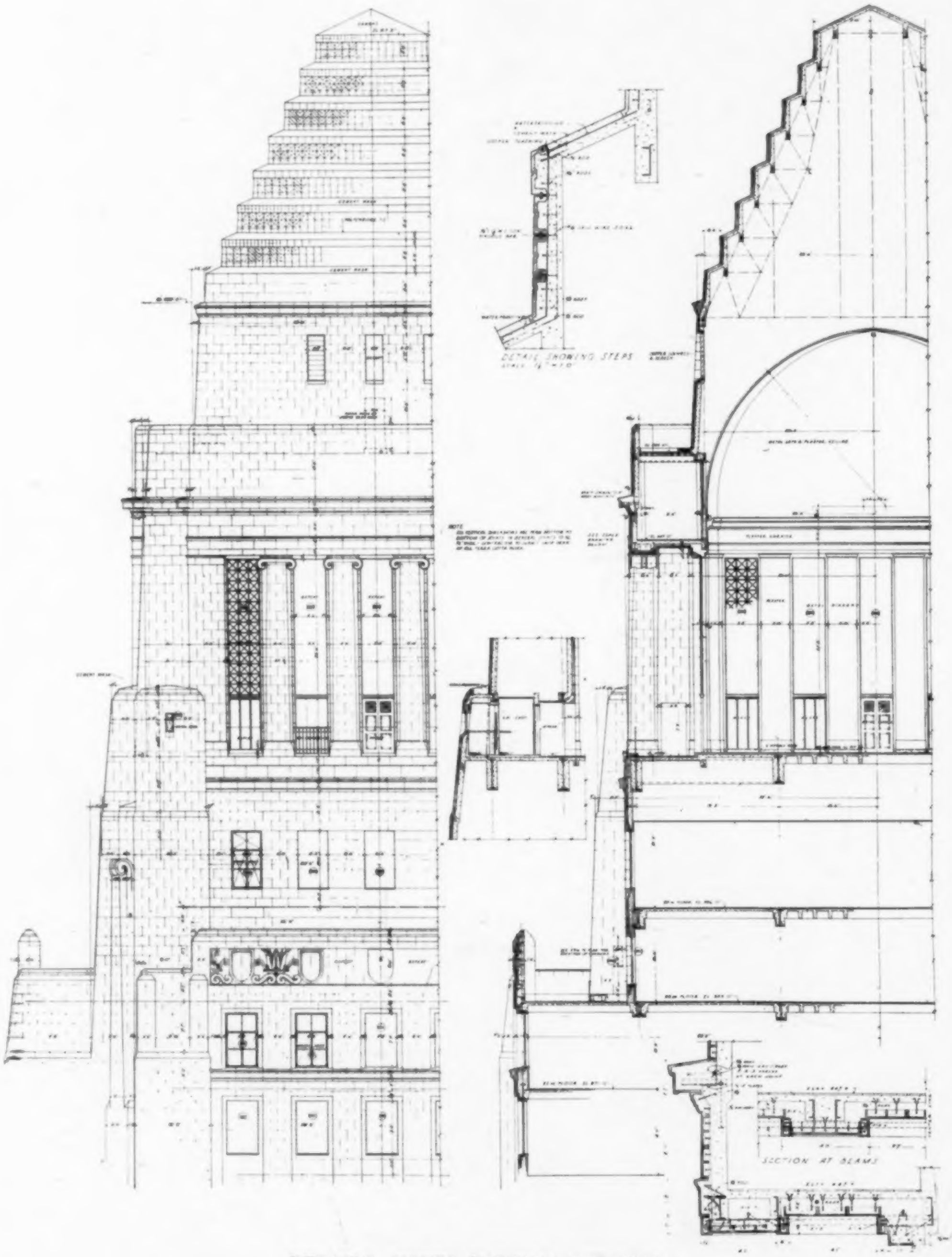
ELEVATION AND SECTION. LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



Details on Back

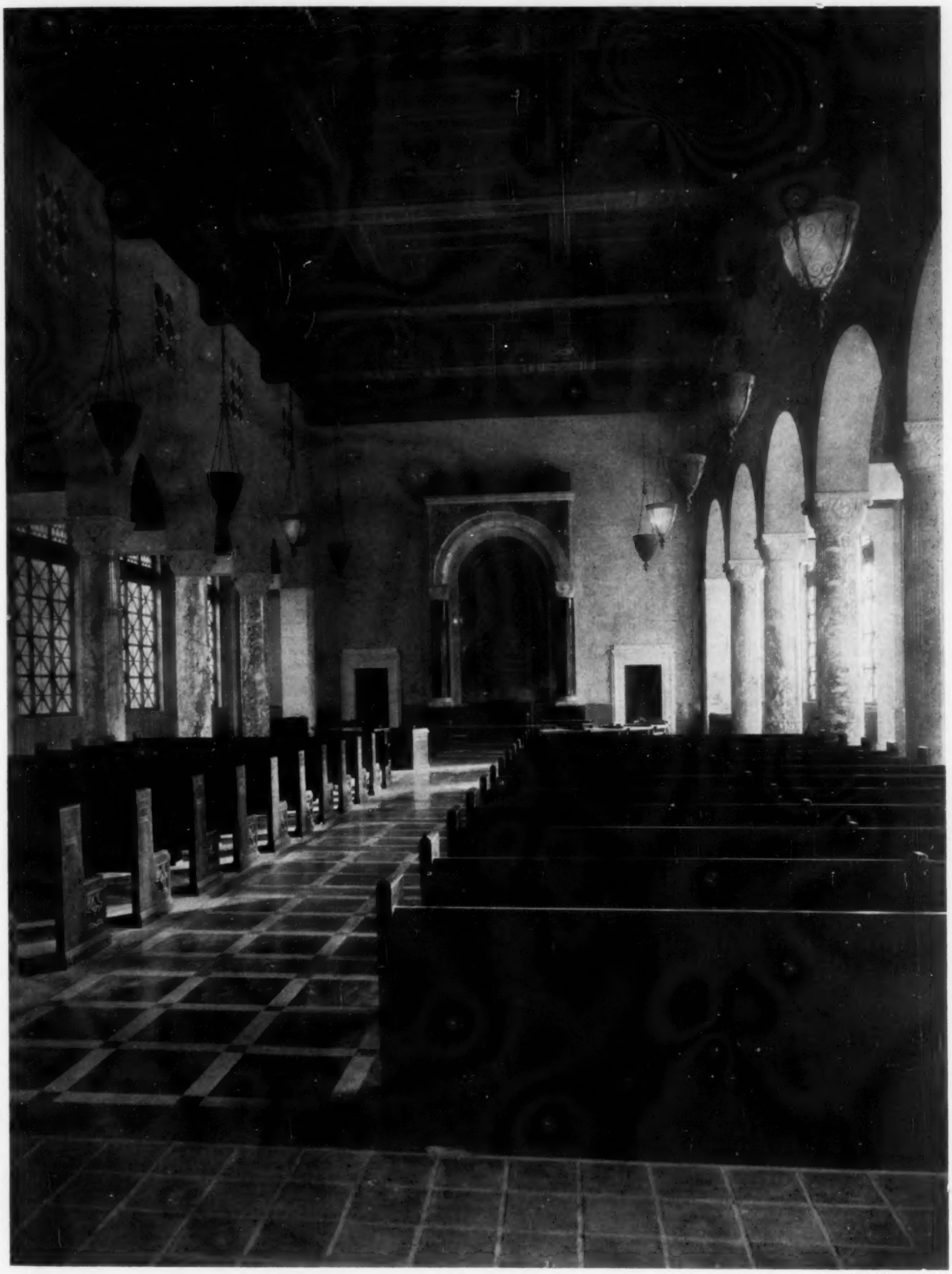
STAIRWAY, EAST LOBBY, LOS ANGELES CITY HALL
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



DETAILS: UPPER PORTION OF TOWER

LOS ANGELES CITY HALL

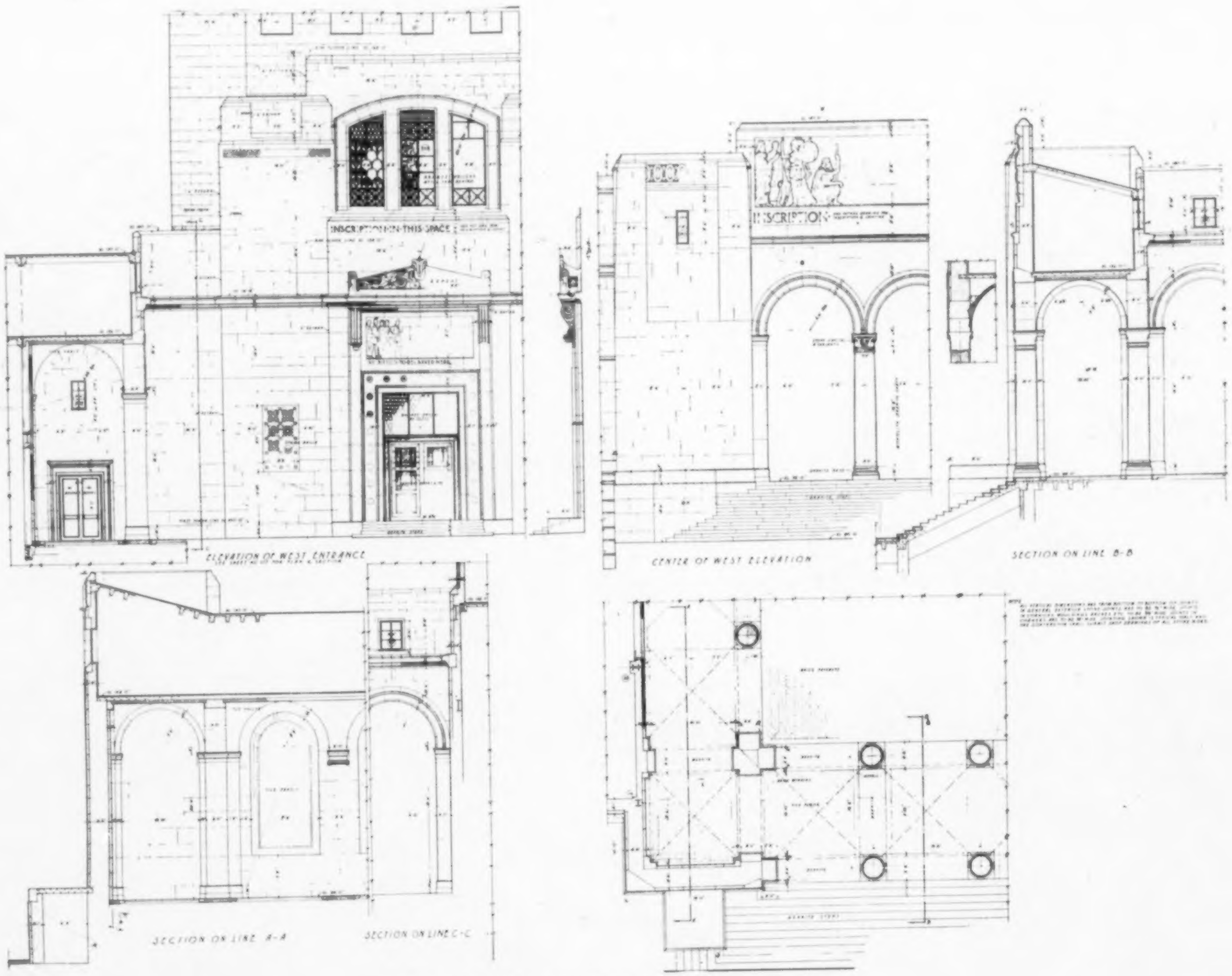
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



Details on Back

COUNCIL CHAMBER. LOS ANGELES CITY HALL

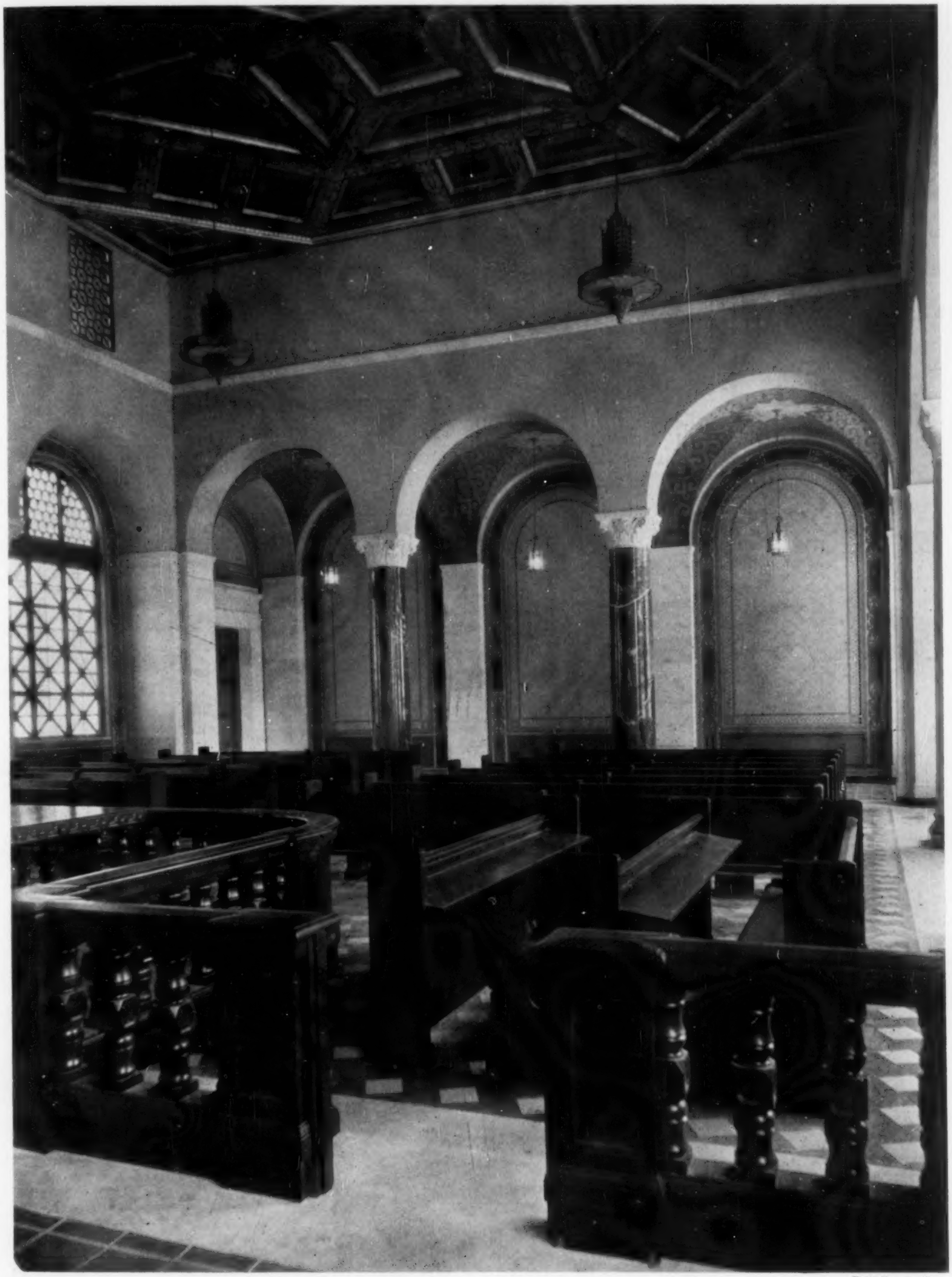
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED ARCHITECTS



DETAILS: WEST ENTRANCE AND FORECOURT

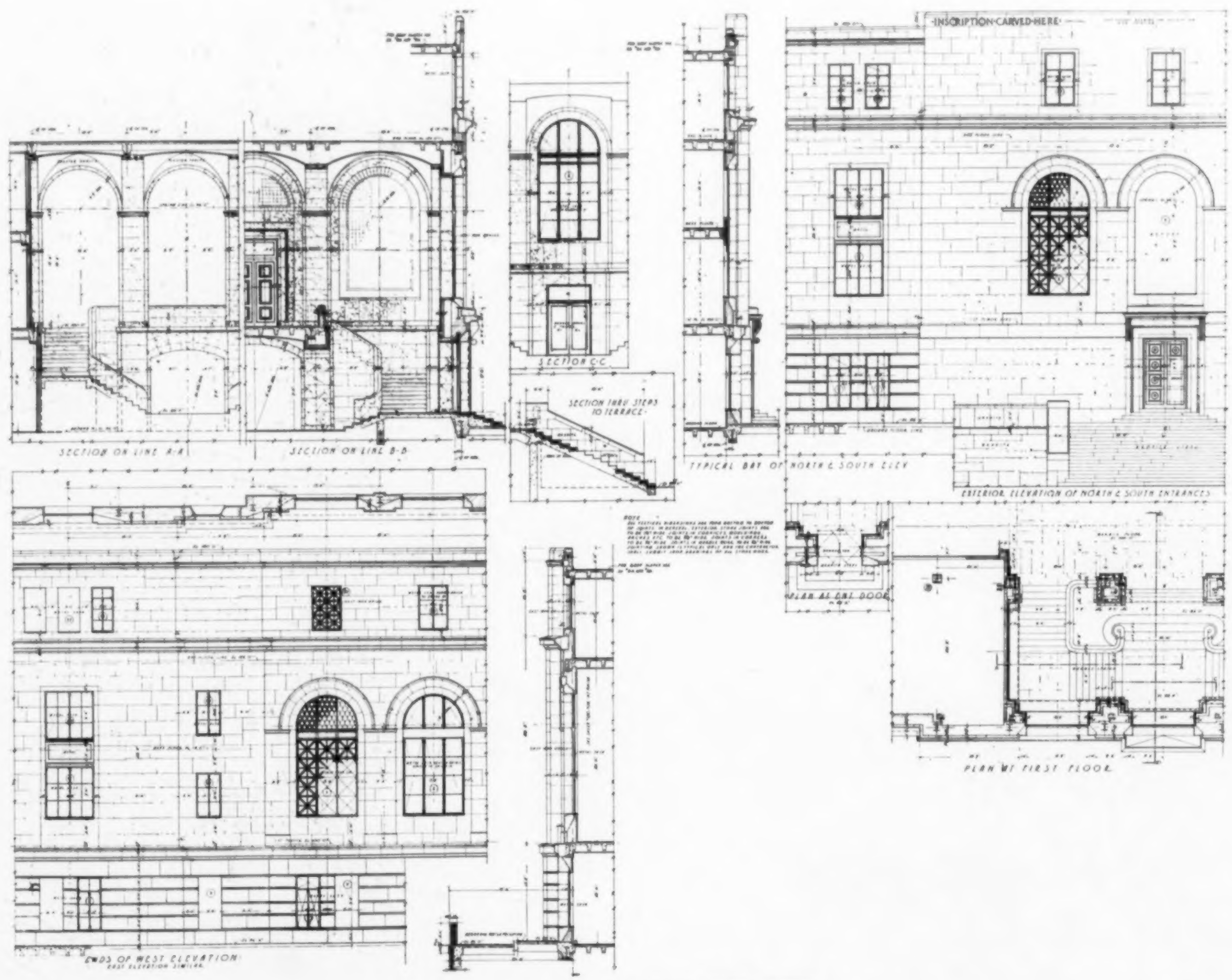
LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



Details on Back

SESSION ROOM, BOARD OF PUBLIC WORKS, LOS ANGELES CITY HALL
JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS



DETAILS: NORTH AND SOUTH ENTRANCES

LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

THE LOS ANGELES CITY HALL

JOHN C. AUSTIN, JOHN PARKINSON, ALBERT C. MARTIN, ASSOCIATED, ARCHITECTS

BY

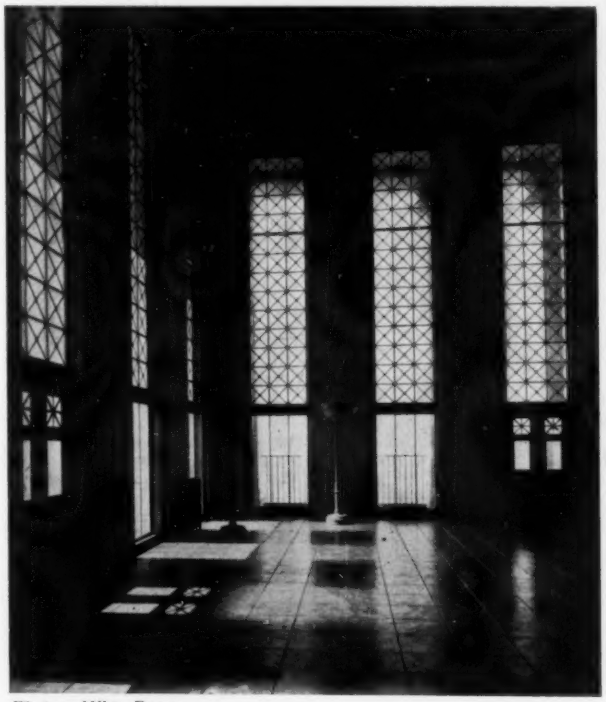
JOHN C. AUSTIN

LOCATED in a section of the city in which, up to a generation ago, its commercial and social activities were largely centered, the new City Hall is a conspicuous landmark in the area about to be transformed into a civic center, comprising practically all important city, county, state and federal buildings. It is more noticeable owing to the fact that the height limit of all privately constructed buildings is 150 feet, and special legislation had to be enacted to enable the city to exceed this height. The legislation referred to developed a point interesting to all architects,—that a municipality is not governed by its own ordinances; therefore, public buildings can be built to any height, while privately owned buildings cannot exceed the height established.

In their preliminary consideration of the problem, the architects determined not to confine themselves to any particular style of architecture in the general design of the building, and the completed structure shows that this determination was carried into effect. Grecian detail was adopted for the main entrance, while Romanesque was used in the arcades of the forecourt, rotunda, council chamber and the Board of Public Works room. The tower and the flanking wings may be regarded as "modern American", influenced by the present-day setback style so widely adopted in other parts of the country.

The building consists of three apparently separate and distinct units, the first of which may properly be termed the sub-structure, extending from the street grade to and including the second story; the second is the central tower, and the third the wings flanking it on the north and south. Native California light gray granite has been used for the facing of all exterior walls of the sub-structure from the sidewalk grades to the tops of the parapet walls surrounding its flat roof. It extends through the forecourt and on that portion of the tower fronting the court to the top of the large central window in the third story. All columns in the court are monolithic with richly carved capitals. All other exterior walls, to the very apex of the pyramid roof of the tower, are faced with dull or matt glazed terra cotta, harmonizing with the granite so perfectly that the difference between them is scarcely discernible. The walls of the four interior light courts are faced with a delicate buff brick laid in white mortar. The roof of the sub-structure is of composition, while the flanking wings of the tower are roofed with clay tile of varicolor,—fire-flashed reds, browns, and old golds.

The front arcade is flanked by plain, massive pylons, which will serve as a substantial background for the statuary proposed to be placed on the large granite buttresses at some time in the future. The large panel over the arcade is intended to be sculptured by an internationally known sculptor to represent local historical events or celebrated personages, whenever the necessary funds become available. Spe-



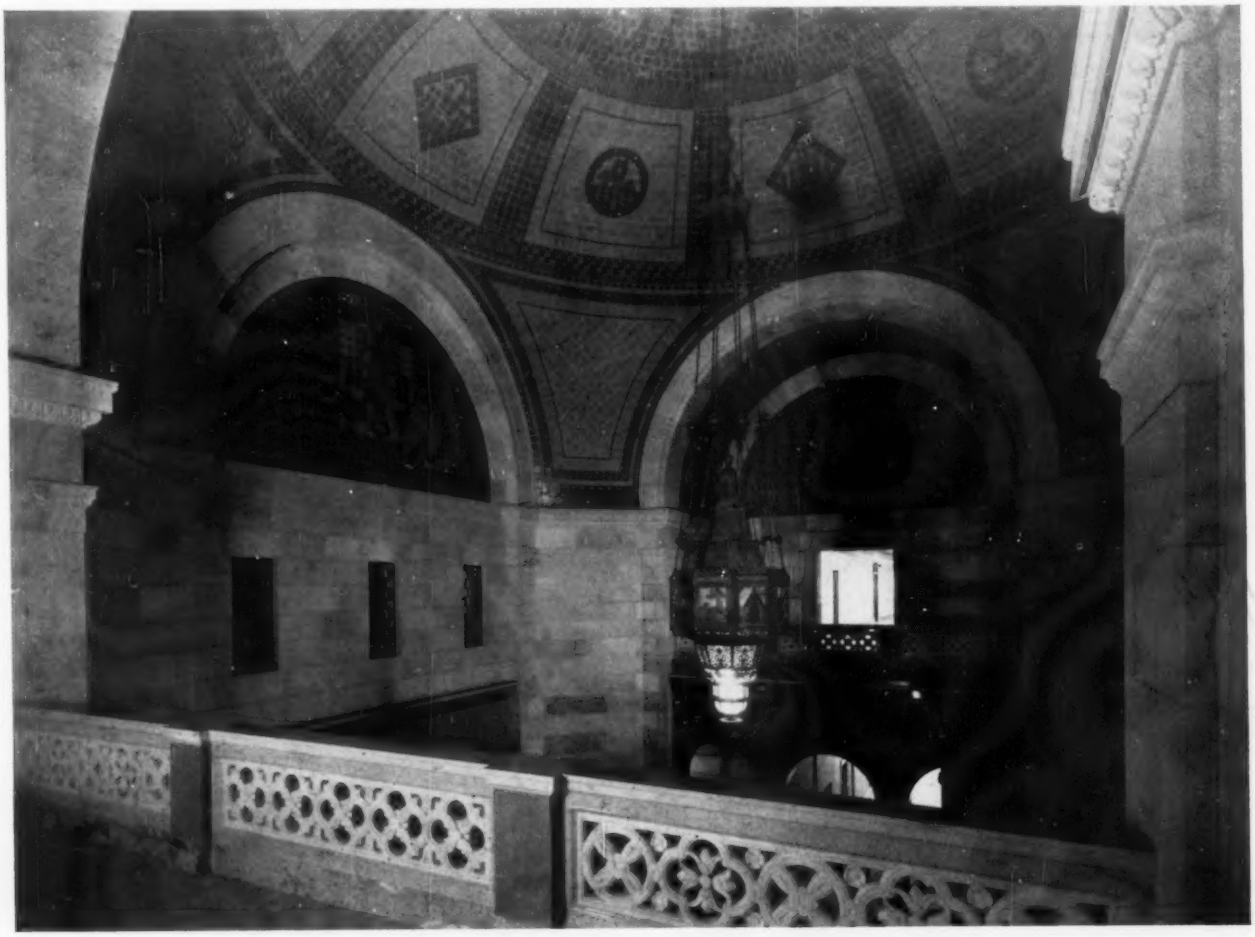
Photos. Niles Berne

Observation Room, Twenty-fifth Floor

Arcade Around the Rotunda

cial attention is directed to the main entrance, which is monumental in character and Grecian in detail, with broad moulded and carved architrave and moulded cornice supported on carved consoles. The pediment is rich in carved ornament, and directly below it the frieze is intended to be sculptured in low relief in harmony with the large panel over the front of the "forecourt" arcade just mentioned. The doors are cast bronze of verde antique finish. Each door has three panels of equal size containing bas-reliefs by Henry Lion, a local sculptor, depicting notable events in connection with the early history and settlement of southern California, and, more particularly, of Los Angeles. These doors open into a spacious vestibule with a high vaulted ceiling and walls faced with a cream colored French limestone to the spring line of the vault. Niches provided in the walls are large enough to receive statuary of heroic size. The floor is of marble in pleasing colors and geometrical designs, while the paneled and coffered ceiling is suitably decorated. The vestibule communicates, through arched openings, with the rotunda, the chief interior feature of the building, which extends up through three stories and is surmounted by a domed ceiling.

In plan the rotunda is square, except for the splayed internal angles, and is completely surrounded by generous passages connecting with the main longitudinal corridors, the elevator lobby, and secondary passages to the angle stairways and adjacent light courts. The floor is laid with colored marbles forming geometrical patterns of great variety. The central circle contains a "caravel" of cast bronze inserted in the marble, which is made to represent the sky and the ocean. The modeling is beautifully and artistically executed. All openings are triple-arched, and the supports are monolithic marble columns of different kinds, generally of dark colors, with carved capitals of light colored marble. The archivolts, also of dark marble, support the second floor galleries, which are protected with balustrades of perforated marble tracery elaborately carved. The large arched openings on four sides with the pendentives growing out of, or emerging from the splayed angles, develop naturally into the dome itself, the surface of which is decorated with highly colored glazed tile, forming geometrical patterns, on a background of acoustical tile of harmonizing tan color. The main corridors have barrel-vaulted ceilings 24 feet high to the crown, and the walls are wainscoted to the spring line of the vault with St. Genevieve marble framed in Napoleon Gray between Botticino pilasters directly below plain projecting ribs of the ceiling. The floor is of pink Tennessee marble and the base of Belgian black.



Dome of Rotunda from the Second Floor, Los Angeles City Hall
John C. Austin, John Parkinson, Albert C. Martin, Associated, Architects

From the main corridor on the south a wide passage connects directly with the council chamber fronting on Spring Street and abutting the southwest court and is well lighted by the 13 large windows and the small clerestory windows above. The council chamber has wide aisles formed by the arcades paralleling the sides. The arcades are supported by highly polished imported marble columns, of which there are six on either side, and each one is of a different variety, yet they harmonize perfectly. They are monoliths resting on solid single-piece moulded green marble bases and surmounted by carved capitals of Champville marble in typical Romanesque designs. Each of the four faces of every cap contains an emblem characteristic of one of the states of the Union. For instance, California is represented by the grizzly bear, Texas by the star, and Massachusetts by the codfish. The ventilation is thermostatically controlled, so that fresh air is kept constantly in circulation without the necessity of opening the windows. The latter are of the inward-opening casement type, constructed of rolled steel sections, and are protected with permanent heavy steel and iron grilles of conventional design painted a deep green to relieve the whiteness of the granite exterior. All glass is obscured and of amber color. Artificial lighting is effected by two lines of seven lanterns suspended from the ceiling at points several feet distant from and opposite the centers of the arcade openings. They are enclosed with amber colored glass, producing a soft, subdued glow. The furniture, which was designed by the architects, is conservatively modern and substantially constructed.

Next in importance, from the standpoint of architectural treatment, is the mayor's suite at the southeast corner of the first floor. This consists of a large reception room off a public lobby or ante-room, approached directly from a wide corridor extending southward from the east lobby. From this anteroom another corridor extends southward to an outer hall, which connects directly with the private office. Adjoining this is the retiring room, then a toilet room, equipped with shower, and beyond are the offices of the mayor's secretary and assistant secretary. The selection of the location of the mayor's office was influenced by the attractive outlook over the park or garden, on the south, the exposure to many hours of sunshine and to cooling summer breezes rendering its occupancy pleasant and comfortable at all seasons of the year.

The landings, treads and risers of the main stairways are of pink Tennessee marble with solid balustrades of a deep pink Kasota stone, while the adjacent walls are wainscoted with French and Pink

Marble Mosaic Floor of the Rotunda, Los Angeles City Hall
John C. Austin, John Parkinson, Albert C. Martin, Associated, Architects

Tennessee marble to the level of the first floor and finished with a moulded cap. Adjacent piers and pilasters are of Botticino marble. The main corridor extends through the building, on the longitudinal axis, from street to street, with secondary corridors along the north, south and west sides, parallel with those walls and a connecting corridor, on the transverse axis extending, at right angles, from the westerly corridor to the east lobby, to provide direct access to the elevators and stairways. The latter run from the basement to the third floor. These corridors have a segmental vaulted ceiling, the floors are tiled with marble, and walls are wainscoted with the same material to a height of 3 feet. The only other room treated more or less pretentiously from an architectural standpoint, is that occupying the entire area on the 25th floor where, by means of well protected balconies, reached through double doorways on each of the four sides, one can enjoy an unobstructed panoramic view of the city and surroundings, reaching from the Sierra Madre range of mountains to Santa Catalina Island and the sea, and to Mt. San Jacinto on the east.

Here are a few interesting facts connected with the building of the Los Angeles City Hall:

Bond issue of $7,500,000 was authorized June 5, 1923.

Architects commissioned August 17, 1925.

Preliminary sketches approved September 16, 1925.

Ground broken March 4, 1926.

Foundations started May 7, 1926.

Tower foundation poured June 14 and June 15, 1926.

Erection of steel framework commenced July 24, 1926.

General Contractors' operations started July 2, 1926:

Cornerstone laid June 22, 1927.

Building first occupied (by Superior Court of Los Angeles County) January 2, 1928.

Building dedicated by Los Angeles April 26, 1928.

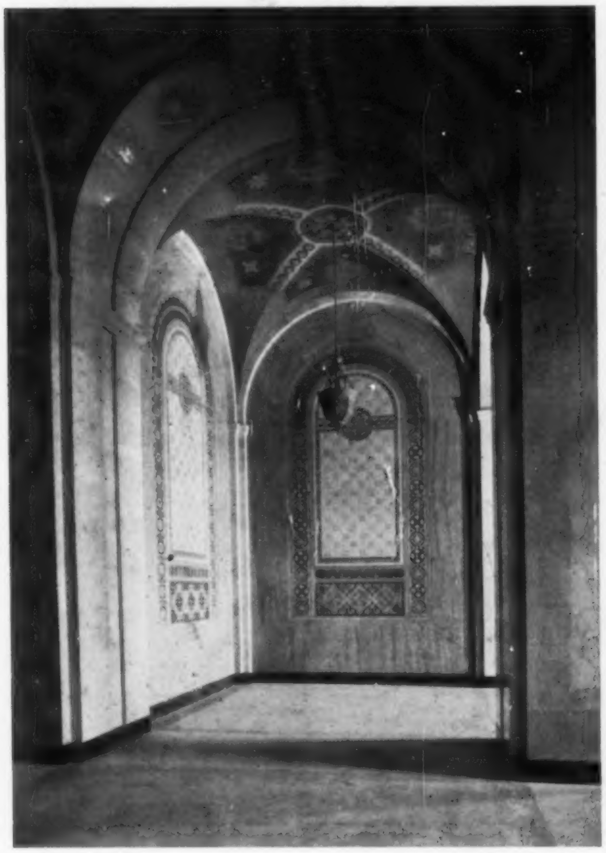
Floor space, 20 acres; volume 12,000,000 cubic feet; dead weight, 95,000 tons.

Structural steel, 8,167 tons; 900,000 rivets; 400 columns; total length of drilled holes, 12 miles.

Eleven elevators; 5-ton ice machine; 129 miles of wire; largest lighting and power switchboard on the Pacific coast; telephone switchboard with ultimate capacity of 2,000 telephones.

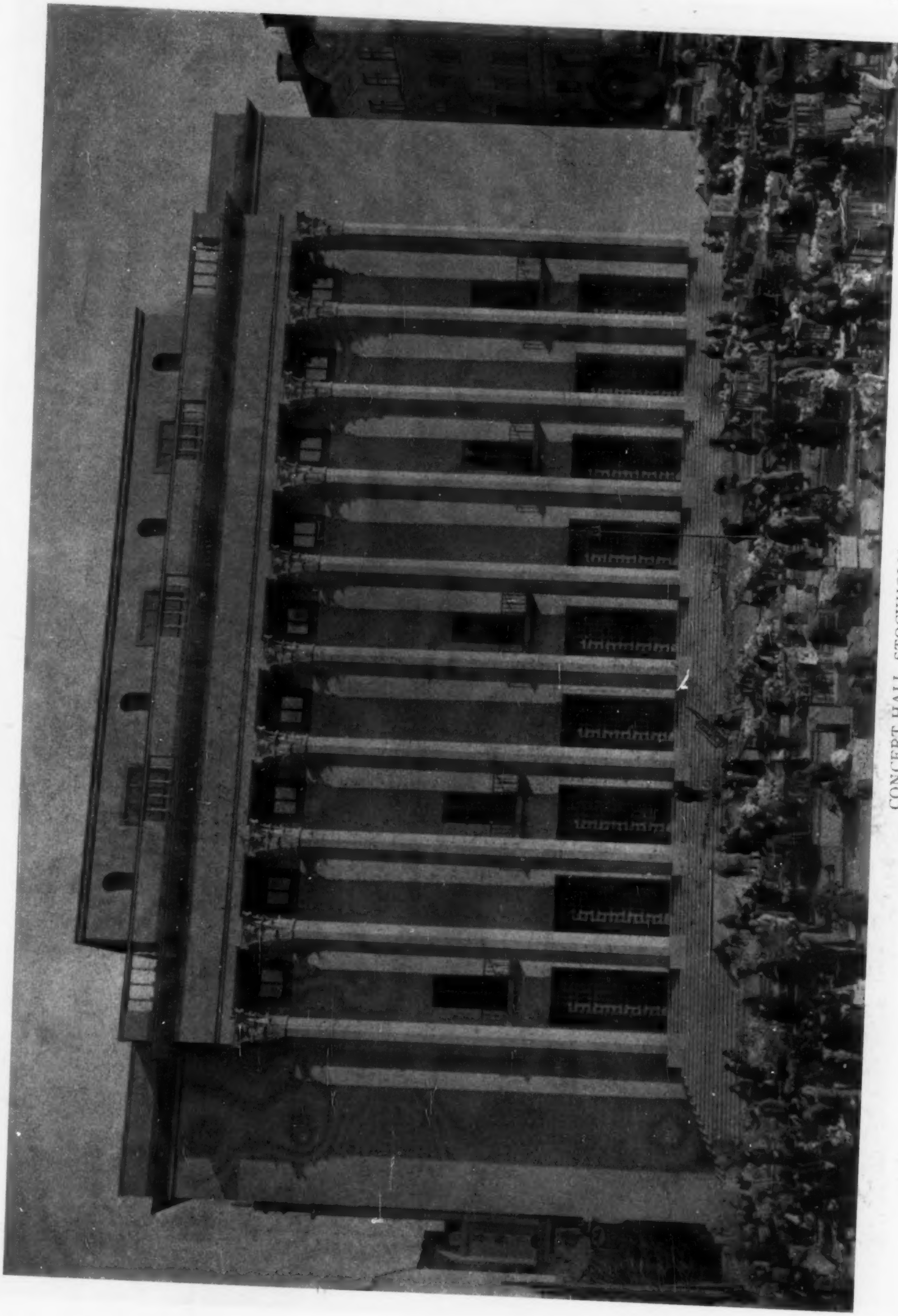
Total investment, $9,000,000, of which the building cost $5,000,000; the site $3,500,000; the decorations, equipment and furnishings $500,000.

Editor's Note. From these statistics it can easily be appreciated what remarkable efficiency in management and superintendence was furnished by the architects of this great building. The handling of this undertaking quite as much as the design of the structure and the working out of all the intricate and interesting details in construction and design reflects great credit upon the architects, who planned it.



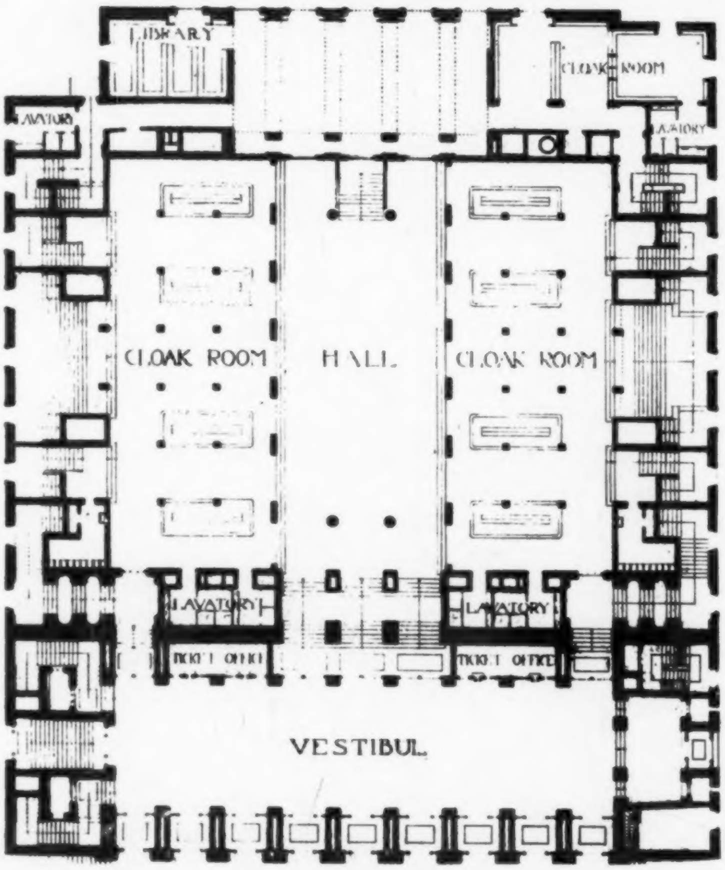
South Lobby, First Floor

North Lobby, First Floor



Plan on Back

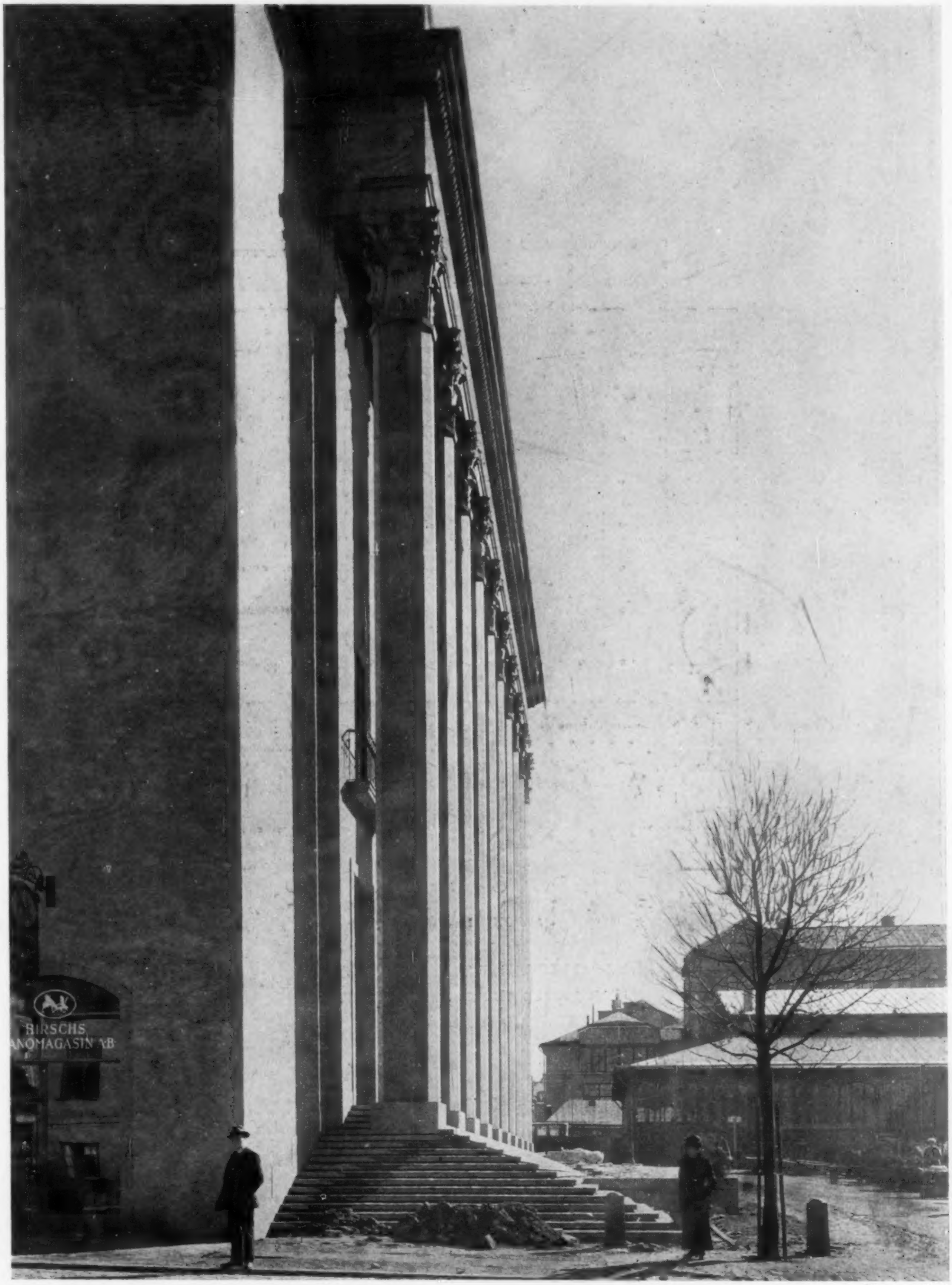
CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT



FIRST FLOOR

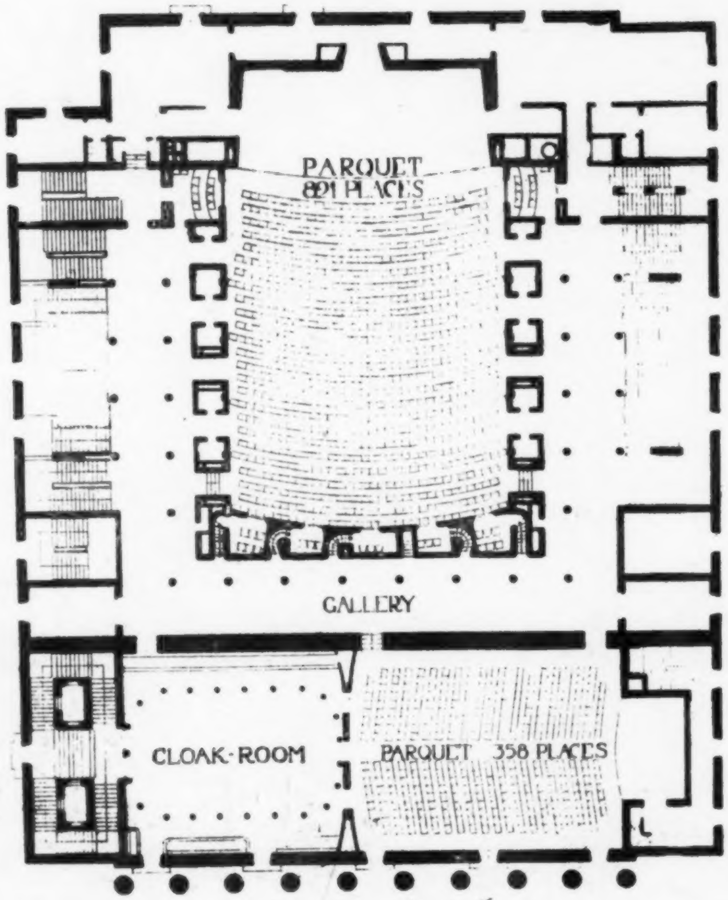
PLAN: CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT

Plans Taken from "Modern Swedish Architecture"
Charles Scribner's Sons, New York



Plan on Back

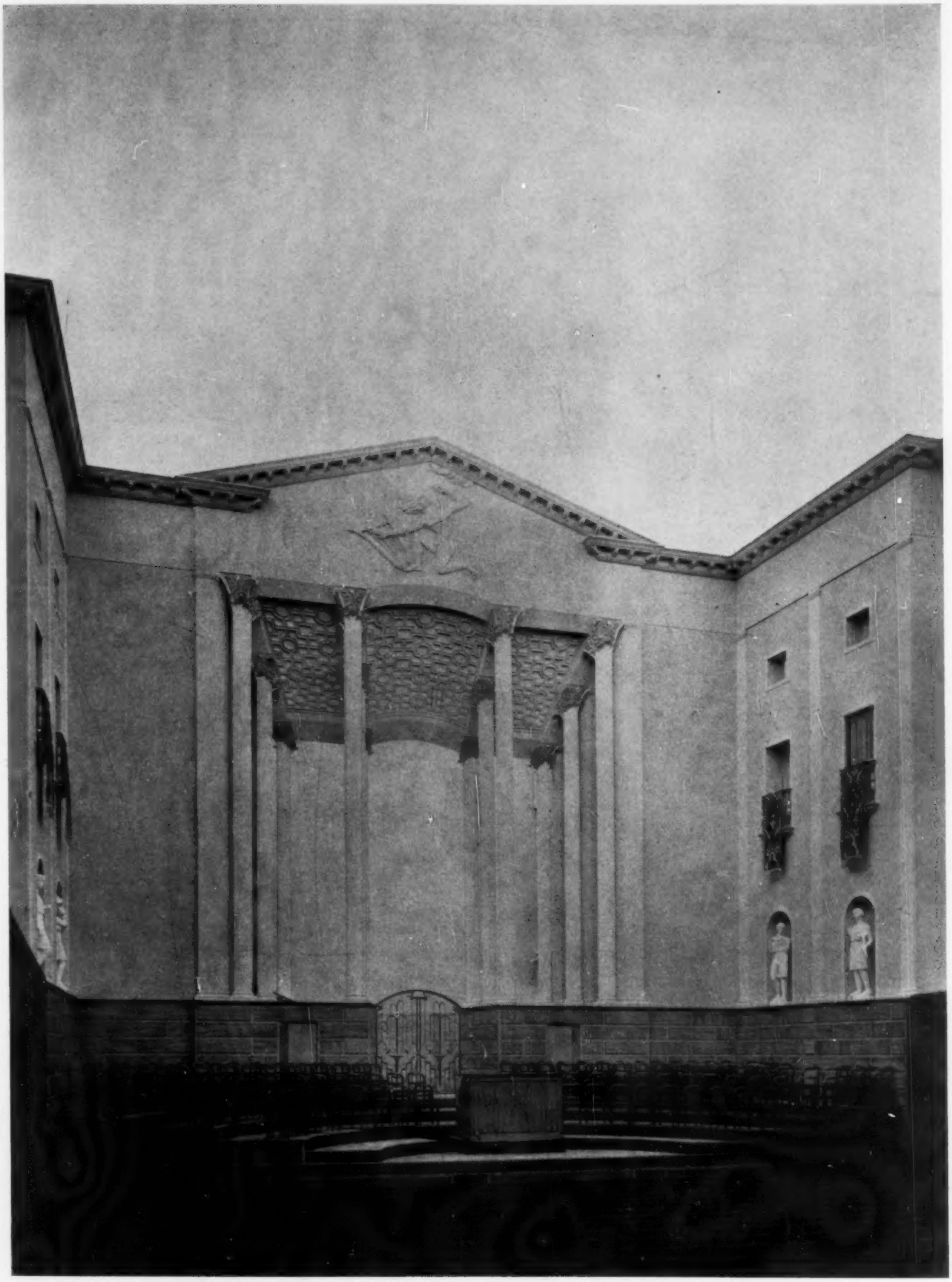
ENTRANCE PORTICO, CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT



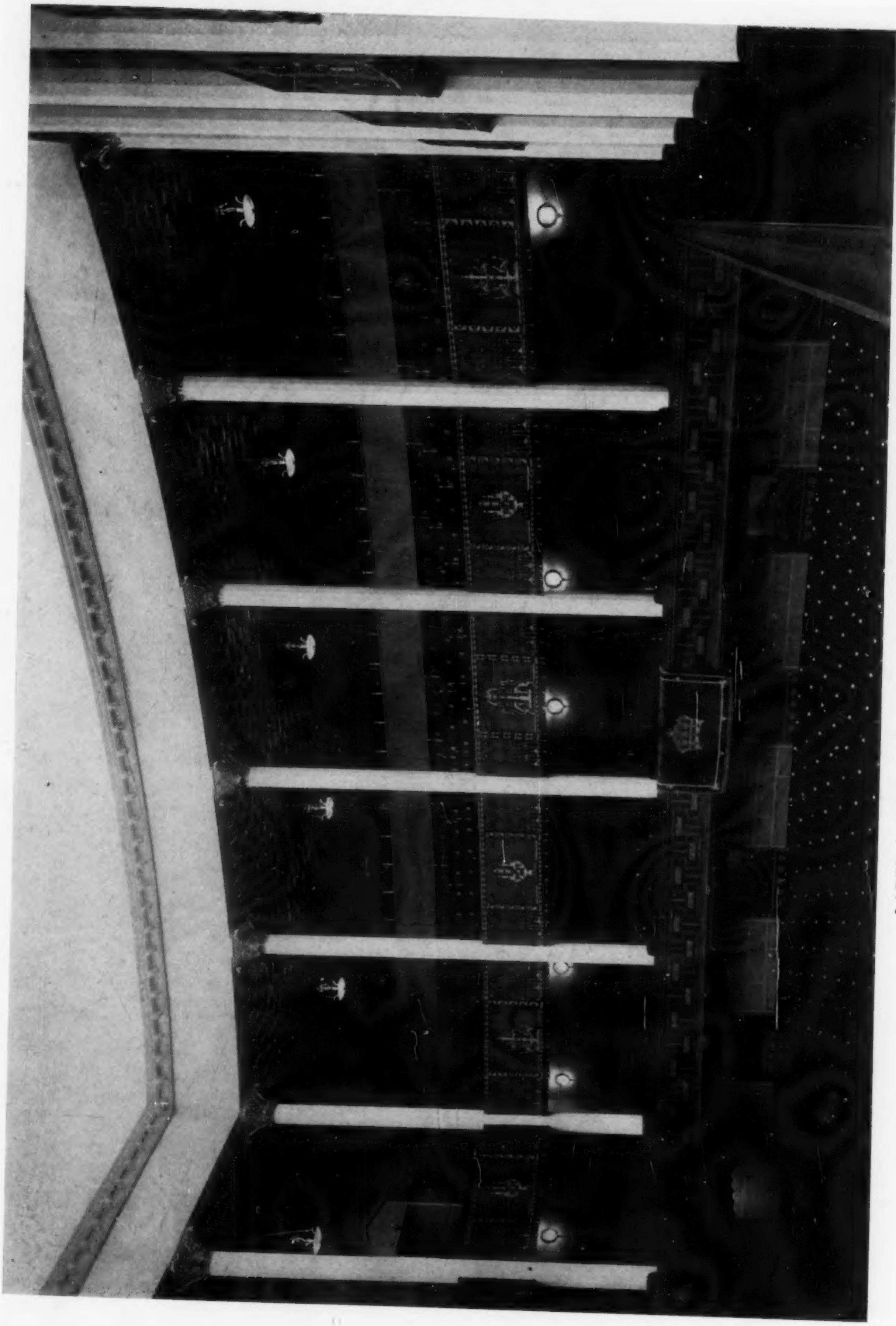
SECOND FLOOR

PLAN: CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT

ENTRANCE FOYER, CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT

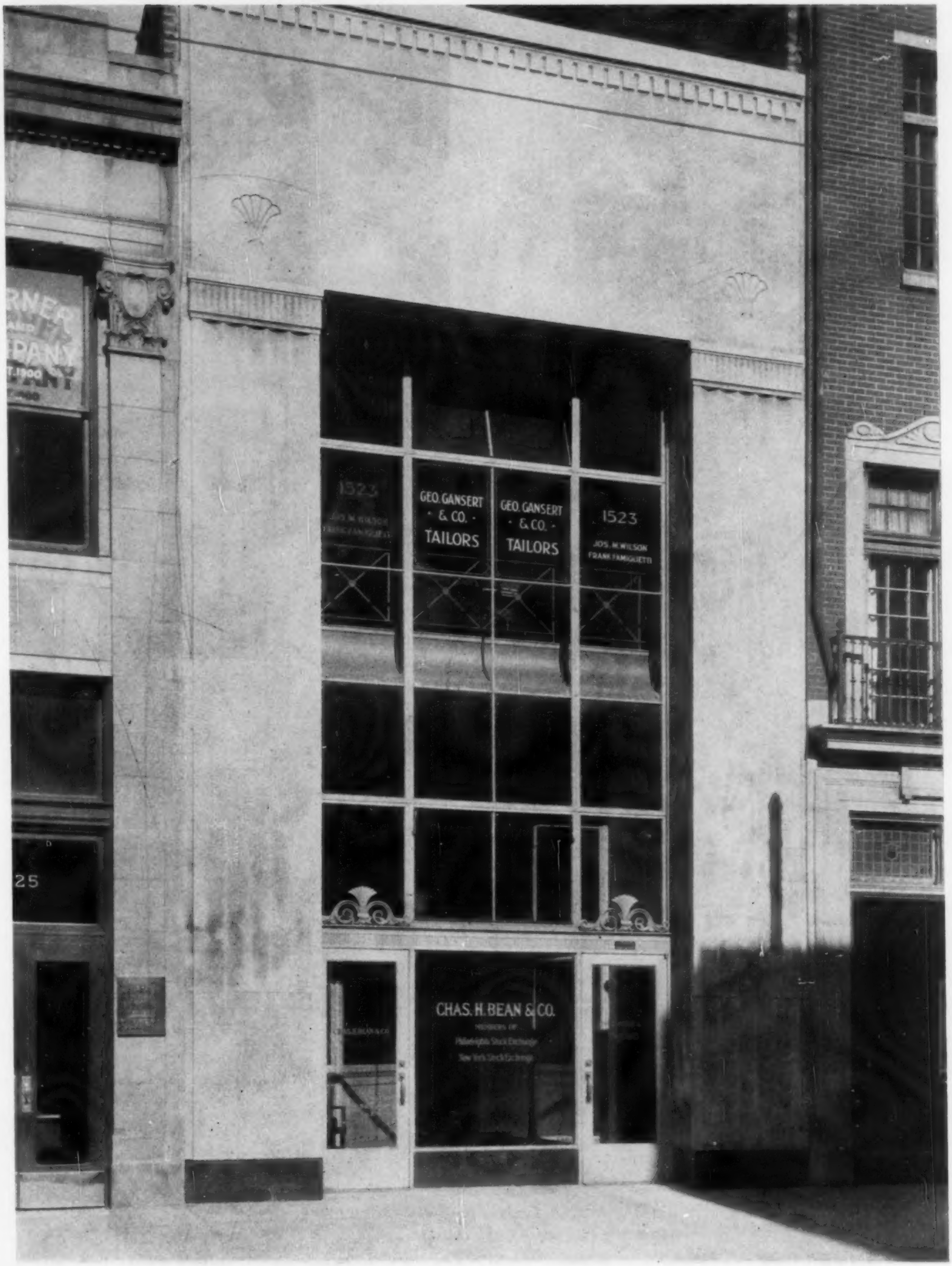


ORCHESTRA PLATFORM, LARGE AUDITORIUM, CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT



LARGE AUDITORIUM, CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT

SMALL AUDITORIUM, CONCERT HALL, STOCKHOLM
IVAR JUSTUS TENGBOM, ARCHITECT



BUILDING FOR CHARLES H. BEAN & CO., PHILADELPHIA
TILDEN, REGISTER & PEPPER, ARCHITECTS

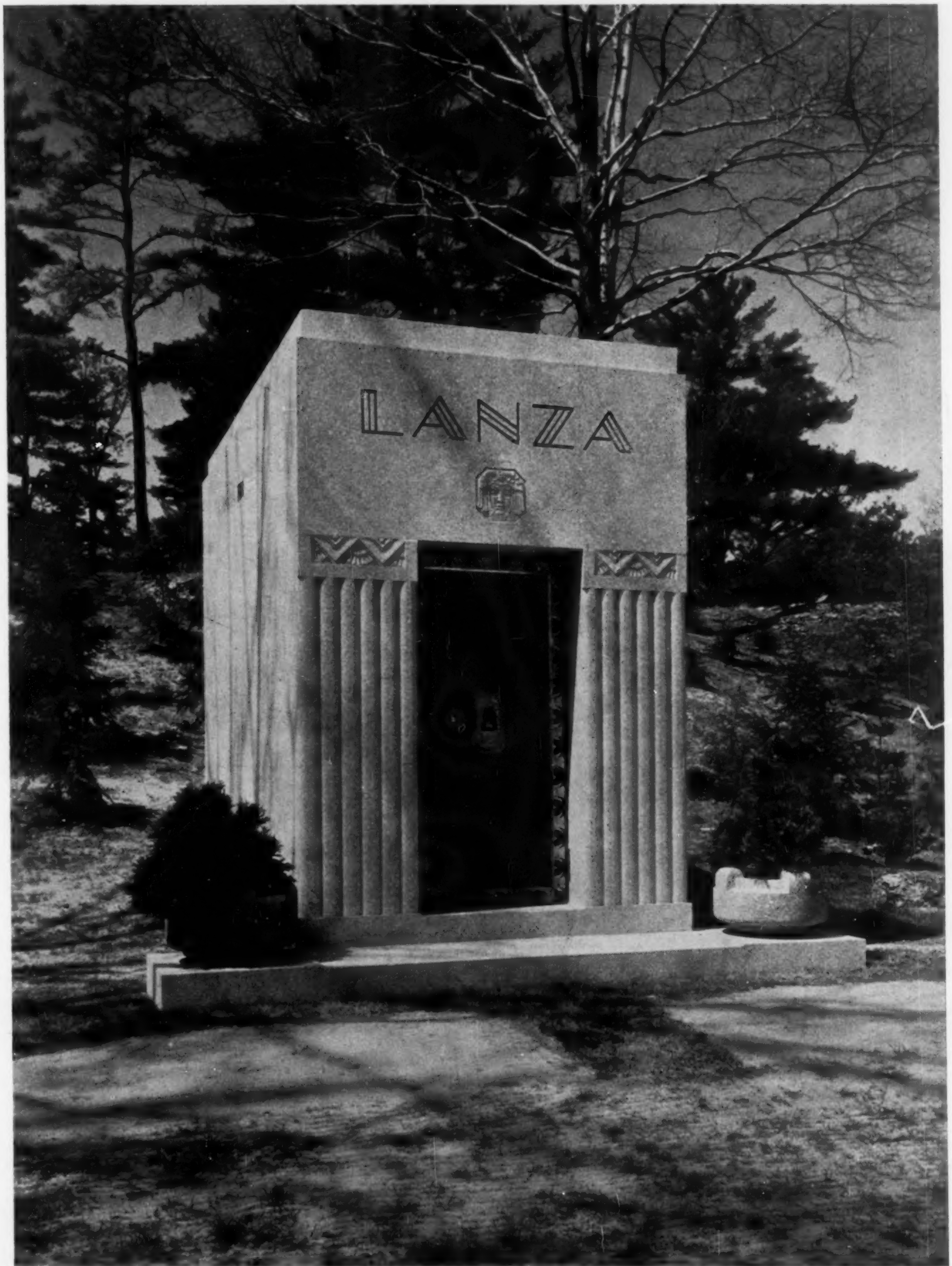
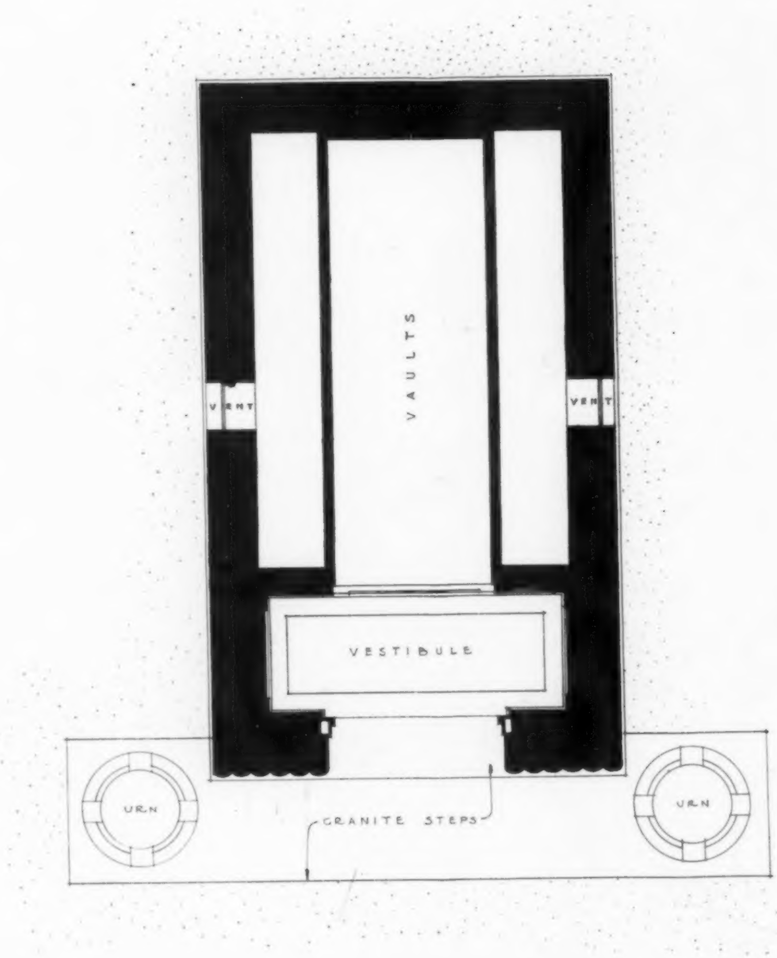


Photo. Paul J. Weber

Plan on Back

MAUSOLEUM FOR C. C. LANZA, ESQ., FOREST HILLS CEMETERY, BOSTON
EDWARD F. ALLODI, ARCHITECT



PLAN: MAUSOLEUM FOR C. C. LANZA, ESQ., FOREST HILLS CEMETERY, BOSTON
EDWARD F. ALLODI, ARCHITECT

AN ARCHITECT IN MOROCCO, PART II

BY
EUGENE F. KENNEDY, JR.
ROTCH TRAVELING SCHOLAR

HOW unfortunate we are in not being able to to enter the courtyard of the Grand Mosque of *El Kairouine!* The hasty glimpses we steal, through any number of its 14 doorways, give us but a vague idea of the magnificence of those spouting fountains, under the lacy pavilions at the narrow ends. Alas! the hordes of contaminated beggars, who haunt the doorways, form an impassable barrier, so continuously do they guard the temple of worship in their efforts to keep unbelievers at bay!

From the restless surging of the noisy streets, an occasional palace garden offers the peaceful contentment of a jasmine-scented oasis. Multitudes of flowers greet our eyes, while orange and lemon trees tempt us with their luscious fruit. Sparkling fountains send cooling jets of water high into the fetid air, and tiny murmuring rivulets run in ceramic channels bordering each path. This surely is the Garden of Paradise,—even the white *burnoosed* gardeners bear a striking resemblance to angels, who have, in some way, mislaid their wings.

Resolutely turning our backs to this scene of sensuous serenity, we climb the steep hill which leads to the cemetery of *Bab Fetouh.* If it be on a Friday that we make this excursion, an interesting experience lies in store for us, as this is the one day of the week when the women visit the graves of their departed husbands. At first we see nothing but indistinguishable mounds of white, until finally some of these take the form of scattered grave stones, while others—more numerous—are the squatting figures of voluminously clothed women who are—to all appearances—rapt in devout prayer, but incidentally—I don't doubt—enjoying this opportunity to gossip. Groups of children, guided by their austere teachers, pay visits to the *marabouts* of the holy men, giving the impression of a flock of chickens following the mother hens, as they waddle from tomb to tomb. Fez completely captivates us. We can never know it, never become tired of it, or bored with it. Weeks roll by, leaving us as ignorant of all its strange beauties and mysteries hidden away in the labyrinth of streets, as we were upon first entering it. Its indescribable filth and contamination, its sickening odors and nauseating sights detract no whit from its picturesqueness. On the contrary, they serve to magnify the beauty and intensify the fascination of this "Pearl of Morocco," as it is called.

Meknes, a few hours west of Fez, is no less beautiful, nor less interesting than Fez. Here again we see the same throngs, and like odors and sounds assail our nostrils and ears. Minarets, similar in design to those we have seen, rear themselves above the housetops. We are continually discovering the same fountains that we remarked at Fez. Despite these resemblances, Meknes has an air different from that of the capital city. It has been called the Versailles of Fez and, like the true Versailles, it is vast and unrestrained. The crampedness of Fez has been left behind, and here we find that the streets are wider, more comfortable, and that large open squares are not uncommon. The principal square is an enormous affair, over 200 yards long, and more than half as wide, surrounded on all sides by high blind walls, and pierced only by a few huge portals. On the east end are two, and one of these, that of *Mansour el Aleuj,* is undoubtedly the most beautiful and perhaps the most monumental and imposing piece of architecture in all Morocco. The high archway, through which there surges a constant stream of people, is guarded by two square bastions supported on arcades. It is resplendent with tiles of blue and green arranged in panels between the brickwork designs, or into colorful friezes and bands. Opposite it on the west side of the square is a long fountain built against the wall. Like the other smaller fountains, it is composed of innumerable pieces of small tiles of various colors, arranged in the most intricate of designs. This is shielded from the weather and the scorching rays of the sun by a wooden canopy delicately chiseled and showing scarcely any trace of the brilliant colors with which —at one time—it was covered. To this most gorgeous of fountains come the most disreputable of men and beasts to partake of the cool waters which it offers, affording a refuge from the stifling heat.

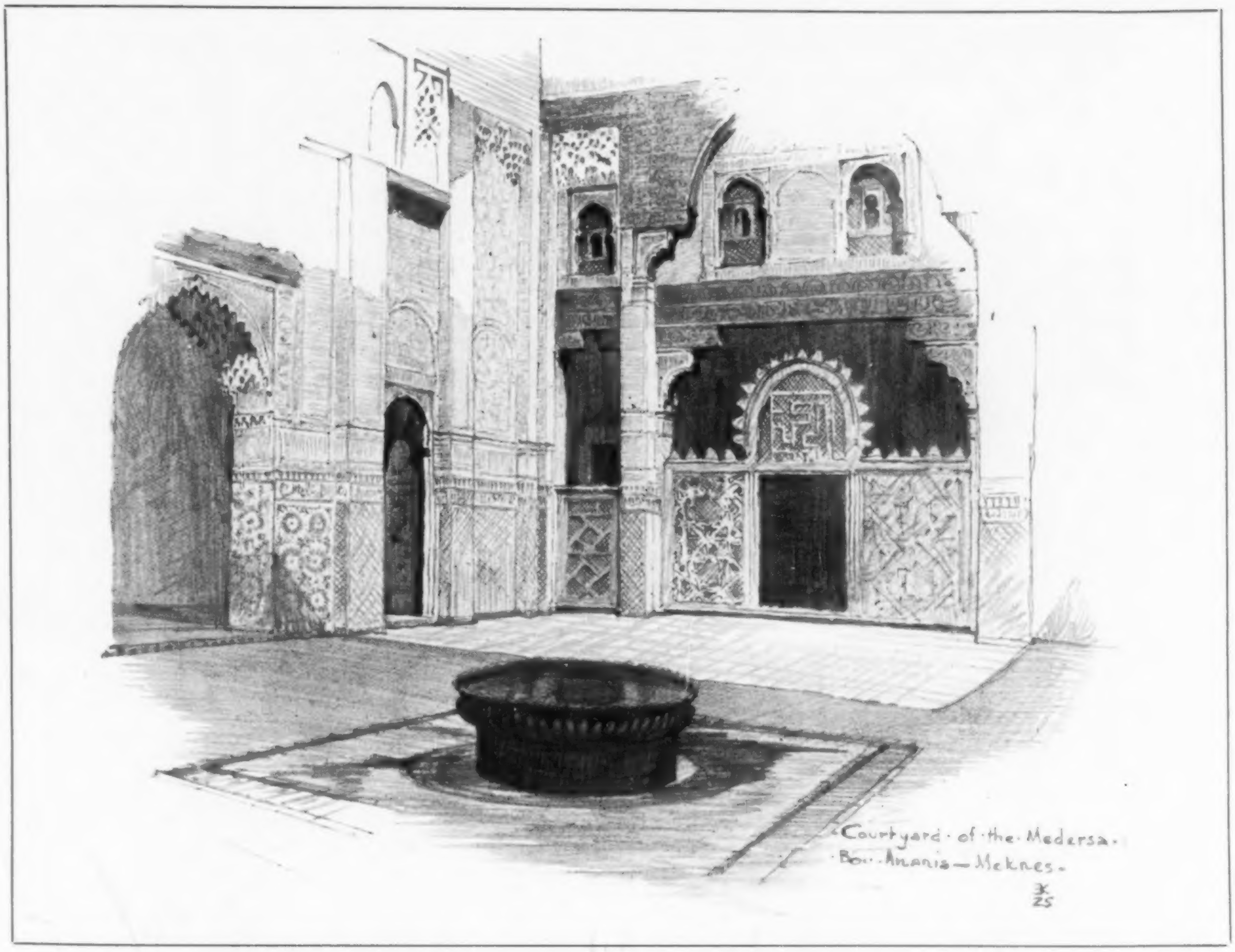
Perhaps we shall be fortunate enough to see the square on a market day when it is overflowing with boisterous merchants and wrangling buyers. The snake charmers squat against the long walls, surrounded by a semicircle of intent bronze and black faces, and blow shrill tunes through reed pipes to the evident delight of a wicked-looking but harmless serpent. Still another silent, interested group squats around an old white-bearded native who reads to them from the Koran, or recounts some of the oft-repeated tales of Scheherazade. These silent groups are strikingly like uncanny calm spots in the midst of a restless, roaring sea. Many are the beauties of Meknes, many unique to her only; many we have remarked at other places, but I hesitate to go any further in describing them for fear of repeating what I have already said,—and because as we have by no means seen all of Morocco, we must push onward, for there are still other treasures beyond.

Rabat is the seat of the Cherifien Empire. It is here that the sultan holds his court, and here also that the governor-general, who is the veritable ruler of Morocco, has his residence. The extensive European renovations have almost entirely ruined the

Fountain at Nejjorine, Fez-el-Bali
From a Pencil Sketch by Eugene F. Kennedy, Jr.

oriental flavor of the place, even within the native quarters, where we find but little to interest us save perhaps the ancient *Kasba*, a fort which presents to the sea a stern, forbidding front, but which in reality protects nothing more than a delightful Moorish garden and museum. Not distant, however, from the edge of the European town, rise the lonely, austere walls of the ancient city of Chellah. The walls are nearly intact and of a gorgeous reddish hue that is dazzling to the eye when seen in the strong sunlight. It is pierced by a wondrous solitary portal of a similar stone, flanked by two hexagonal turrets and carved and decorated, after the fashion of the Moors. Here, however, the carving is much coarser than that of the inland cities, due perhaps to the use of stone rather than of brick and tile, and perhaps because the natives of the famed Barbary coast were a hardier race than their less piratical brethren of the interior. The desolate air of the place fills us with awe. No trickling stream of colorfully clothed natives comes through the archway. There is not a sign of any life except for one lonely shepherd who leans upon his long staff, seemingly oblivious to the wanderings of his scattered herd. We enter, half expecting to see the usual busy street scene, but there is none of that, not even the inevitable beggars who, squatting in the cool shade of the archway, beg pennies in exchange for the bounteous blessings of the most potent Allah. Nothing! Nothing but a riotous mass of trees, unkempt shrubbery and rolling grassy hills, until we suddenly discover the shaft of a graceful minaret away to the right, hardly visible through the maze of foliage. Only when we come directly upon it do we find any signs of human habitation, and then only a few hovels clustered about the minaret, the tiny mosque, and a deep, wide well. The city, if ever there was one enclosed within these ruddy walls, has completely disappeared as if swallowed up by the earth. There are not even the usual piles of rubbish, generally associated with ruins of any sort, to permit any fanciful—or somewhat idle—speculation as to what might have been.

Directly across the mouth of the river from Rabat lies its twin sister, Sale, twin sisters only because they are side by side, for in appearance they are widely different. Sale was never blessed (or cursed) by an inroad of infidel Christians, and has consequently preserved its oriental character. I am not going to make any attempt to describe Sale, though it is not uninteresting and boasts an occasional beau-



Courtyard of the Medersa, Bon Anania, Meknes
From a Pencil Sketch by Eugene F. Kennedy, Jr.

ty spot in the shape of a *medersa,* mosque or portal. If for nothing else, it has lost much of its beauty by the zeal of its inhabitants in keeping it a spotless white. So many coats of whitewash have been applied to its walls, that now, I don't doubt, the town is larger by some feet, though its streets are narrower by a few inches. In itself this is no sin, and the white city is certainly most quaint, but in many cases the whitewash has filled in the crevices of the carvings, and made of the crisp mouldings blunt, undulating bands, with little architectural character.

No Moroccan trip begins to be complete until Marrakesh has been visited and studied. Here is a city that rivals in size and splendor the magnificent Fez and Meknes of the north. Primarily it has a different atmosphere from either of its northern sisters, and presents an ensemble that more closely agrees with our imaginative pictures of what a Moroccan city should resemble. Numerous palm trees (missing in the north) give it that air of tropical voluptuousness one finds in a verdant oasis in the middle of the Sahara. The masses of people are as varied and as interesting as elsewhere,—perhaps more so,—for here we find the men of the desert. Trains of camels enter and leave its many portals, carrying with them romance and adventure to remote parts of this desolate world. Its palaces are unsurpassed in beauty and magnificence, while its gardens seem to be more exotic than elsewhere. *Medersas* of sparkling splendor are scattered here and there. Beautiful doorways and tall minarets continue to attract our attention in our journeys through its streets. In fact, nothing is missing that we found at Fez or Meknes. There is, as a matter of fact, more apparent,—not requiring discovery.

Taken altogether I know of no spot in the old world where the interest is so intense as in Morocco. As soon as we have first entered its borders, we are transported into a new sphere; we are carried back to bygone years not as at Carcasonne by our imagination in viewing its hoary walls of the middle ages, but by the very life and customs of its inhabitants, as well as its monuments; one feels as out of place amid these *reliques* of a distant century as undoubtedly Gulliver felt in the land of the Lilliputians, and strangely enough we are wont to associate Washington Irving's "Tales of the Alhambra" more with Fez or Meknes than with the empty halls of the "Ambassadors" or the Court of the Lions in Granada. It is one of the homes of romance left to the world.

UNIVERSITY EXPANSION AS TYPIFIED AT HARVARD

BY

CHARLES G. LORING

MANY educators question the wisdom of rapidly expanding our school and college plants, claiming that the buildings overshadow the importance of the teaching staffs, that the cost of bricks and stones means curtailing salaries, and that the vital, human essence is diffused,—not strengthened. The acceleration in the output of "bigger and better" public schools, private academies, state colleges and endowed universities is universal from coast to coast, and the evolution of pedagogic theories and of architectural styles is correspondingly speeded up. There is no private scrool or college but has alumni boosting for new buildings or exhausted by a successful drive!

The Architectural Forum in the October and December issues published monographs on the new Graduate School of Business Administration and on the new Fogg Museum at Harvard, two costly symbols of the expansive tendencies of the times. In terms of square feet of area and in the number of buildings, the plant in Cambridge has more than doubled in the last 25 years. The ground built over since the end of the nineteenth century is 133 per cent of that covered during the nineteenth century, and these figures do not include structures, like the Medical School, built at a distance from the center.

Unlike Yale and Princeton, where the transformation has also been rapid, Harvard has not "gone Gothic"; there are no dream towers against the sky, like those of Harkness or the Graduate School. Perhaps the near-Gothic "remains" left standing from the Civil War period, that false dawn heralded by Ruskin, are reason enough to cling to the earlier, indigenous traditions! The Colonial, the "Cambridge Georgian," the red brick and white trim, are the accepted mode along the Charles River, and year by year they offer new combinations of a familiar alphabet. The corporation has of recent years commissioned but one firm of architects for all its designing, except where a munificent donor has imposed his own wishes. The excellence of the new Fogg Museum and of the recent groups of freshmen and yard dormitories has shown the wisdom of the choice, while the domineering lack of scale of the Widener Library emphasizes the exception.

The small scale of Colonial, its domestic quality, is admirably suited for dormitories; witness Massachusetts Hall, two centuries old, or McKinlock, opened last autumn. The style is sufficiently elastic to be varied and yet kept harmonious, as in the freshmen dormitories. The easy freedom of this group, strung along the north bank of the Charles, is in strong contrast to the tight and monotonous repetition in the students' quarters of the business school facing the parkway on the southerly shore. In mass and texture, in charm and dignity, in everything except group planning, the college units outrank those of the Baker Foundation. It might be claimed that allowances should be made for the lack of trees shown in the entrancing perspectives by Steffins, for the proposed arcades linking the buildings, or for the cupolas on Hamilton and Mellon Halls, called for by the architects but excluded by the budget; yet the fact remains that the business school is today being judged by its present appearance and not by what it may be in the future. Viewed from the Cambridge shore, there is just a suggestion of "quantity production" in the two, 300-foot long facades which face the river, and on closer inspection the stiff, vertical lines of the quoins, where concrete is painted a flat white, suggest the factory rather than academic shades. Elements contrasting in mass and color, the smaller stucco halls, flanked by arched gateways, and the proportions and variety in the administration building, especially its rear elevation, are the most successful features.

The business school library is the focal point of the composition and has a straightforward dignity and functional expression, but in the windows the shallow reveals and slender muntins, combined with the necessary but over-large expanses of glass, impair the monumental quality. This building and the Museum are contemporary, very similar in the sizes and shapes of the plots covered, and each has 16 openings on the main floor facade. It is therefore natural to contrast these divergent interpretations of the same historical period. In the Museum, where there is overhead lighting, on the second story there are only eight relatively small windows, and the openings on the main floor have not only less area than those in the library but have smaller lights of glass heavily framed in white. In the Museum all the subordinate details, whether the iron handrails, the central fanlight, or the carved ornament are more robust and vigorous. The library of the business school is frankly the central workroom of its group. The college Museum is withdrawn a bit from the university; its facade bespeaks the safeguarding of beautiful objects; the very brick and stone and wood are combined in a quality of restrained opulence. The rear of the library has conspicuously temporary segments of wall for future expansion; it is ready for a bigger business school, but the back of the Museum is much more surprising. The front facade is two stories in height, with a basement masked by a grassy terrace, while the rear wing is five flights high,—a finished and studied university building, with almost the air of a refined apartment house.

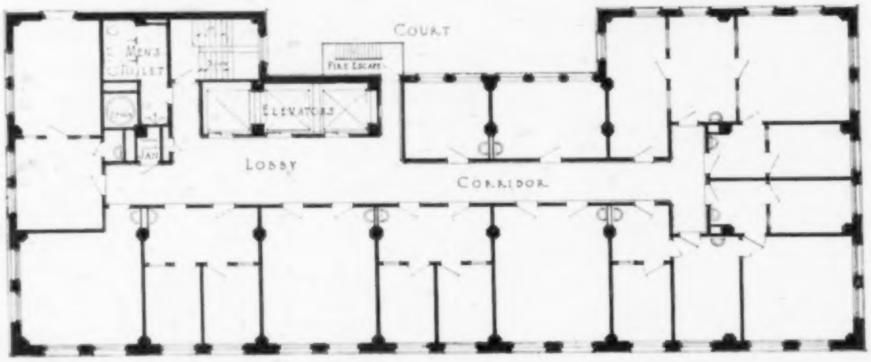
Truly, John Harvard and the puritanical forefathers of the college would be astounded at its growth and could never have conceived its extent.

Photos. Laura Gilpin

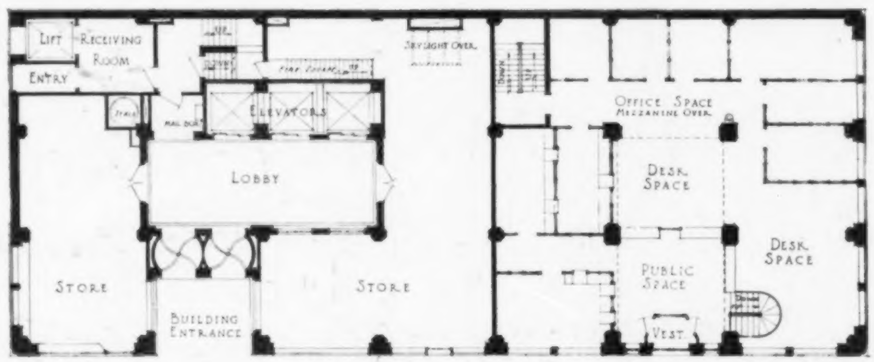
Plans on Back

SECURITY BUILDING, DENVER

W. E. & A. A. FISHER, ARCHITECTS



A TYPICAL FLOOR



STREET FLOOR

PLANS: SECURITY BUILDING, DENVER

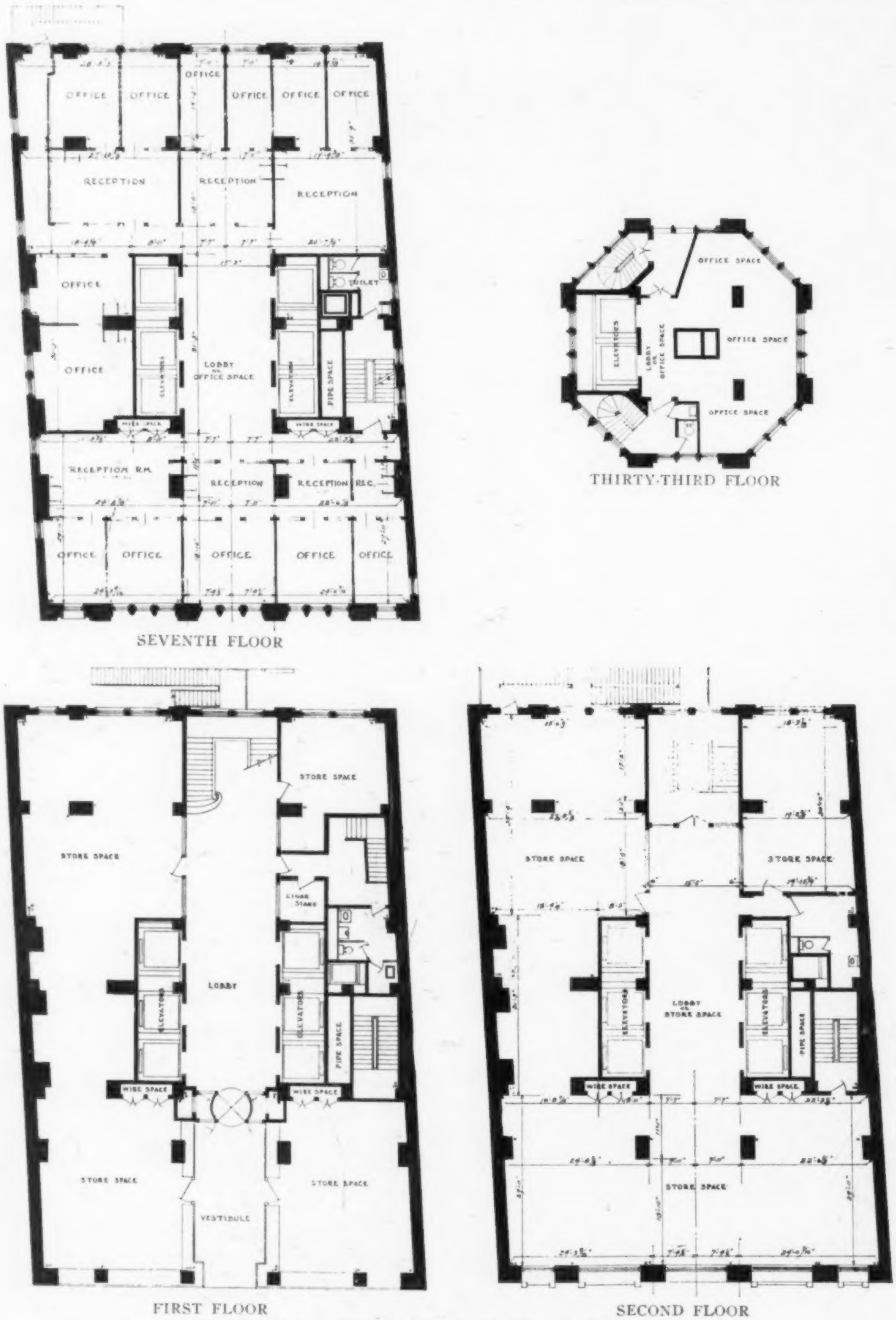
W. E. & A. A. FISHER, ARCHITECTS

DETAIL, UPPER STORIES, SECURITY BUILDING, DENVER
W. E. & A. A. FISHER, ARCHITECTS

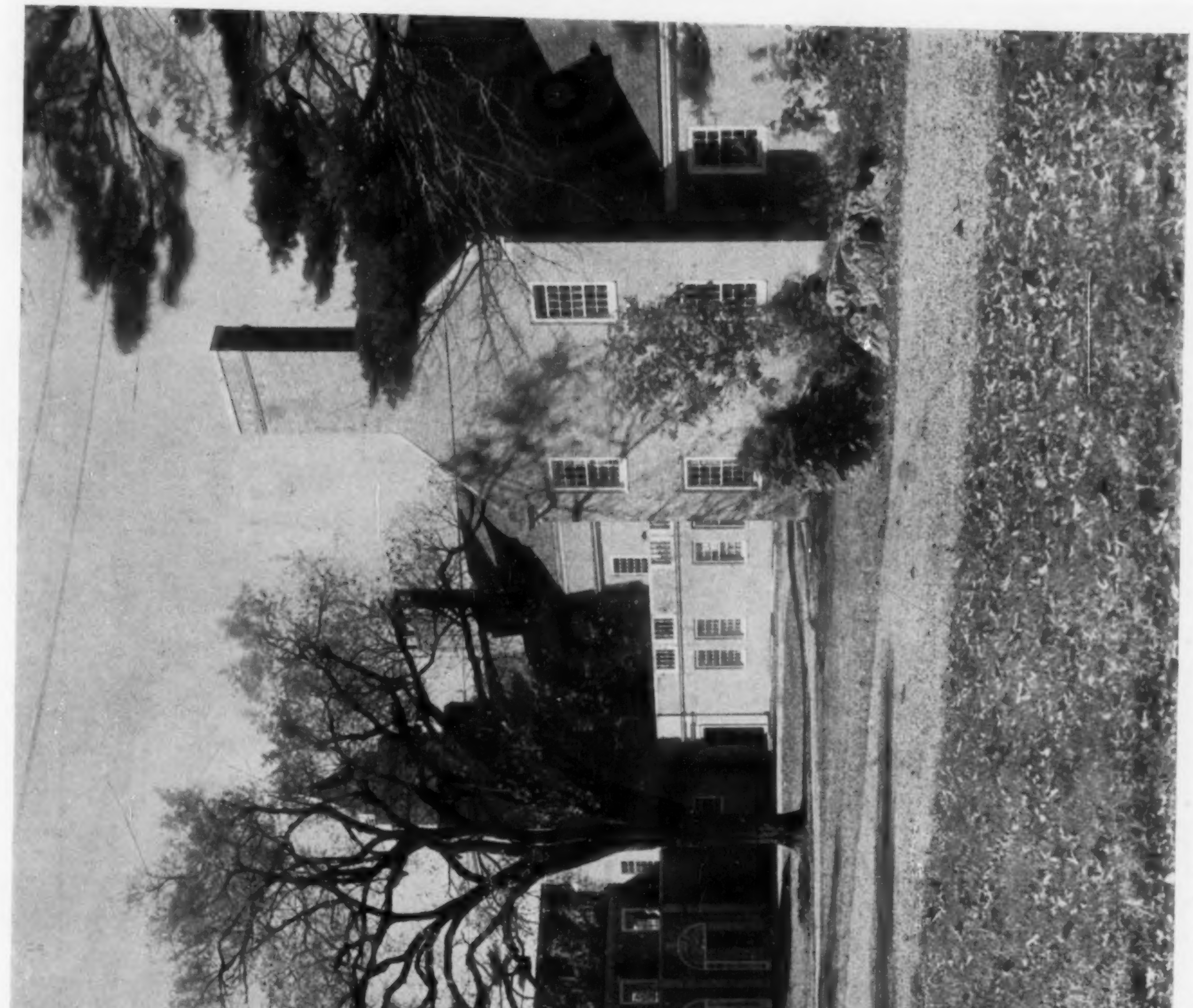
Photo. E. L. Fowler

Plans on Back

THE MATHER TOWER, CHICAGO
HERBERT HUGH RIDDLE, ARCHITECT



PLANS: THE MATHER TOWER, CHICAGO
HERBERT HUGH RIDDLE, ARCHITECT

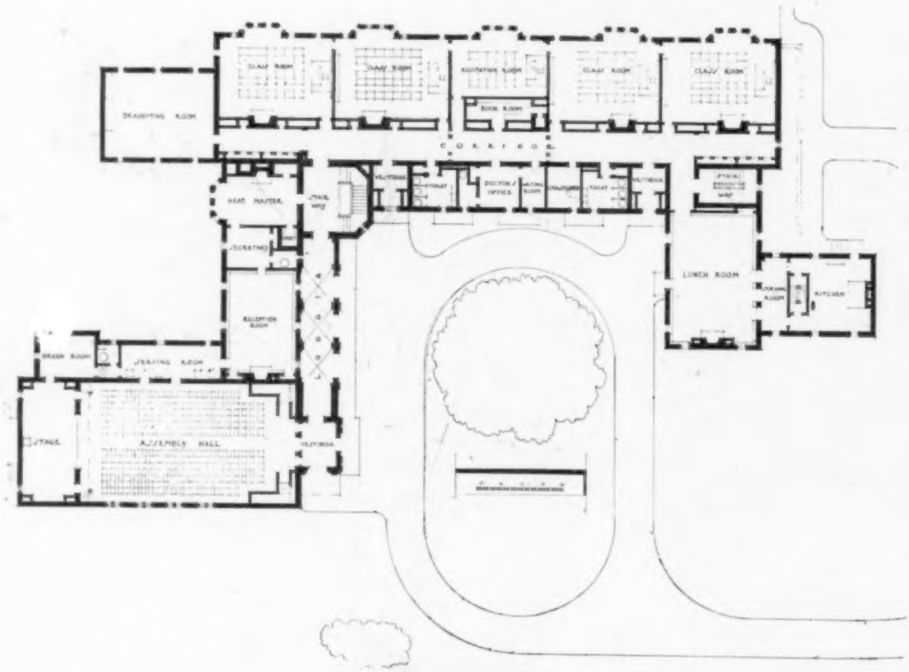


Photos. Paul J. Weber

ROXBURY LATIN SCHOOL, DEDHAM, MASS.
PERRY, SHAW & HEPBURN, ARCHITECTS

Plans on Back

SECOND FLOOR

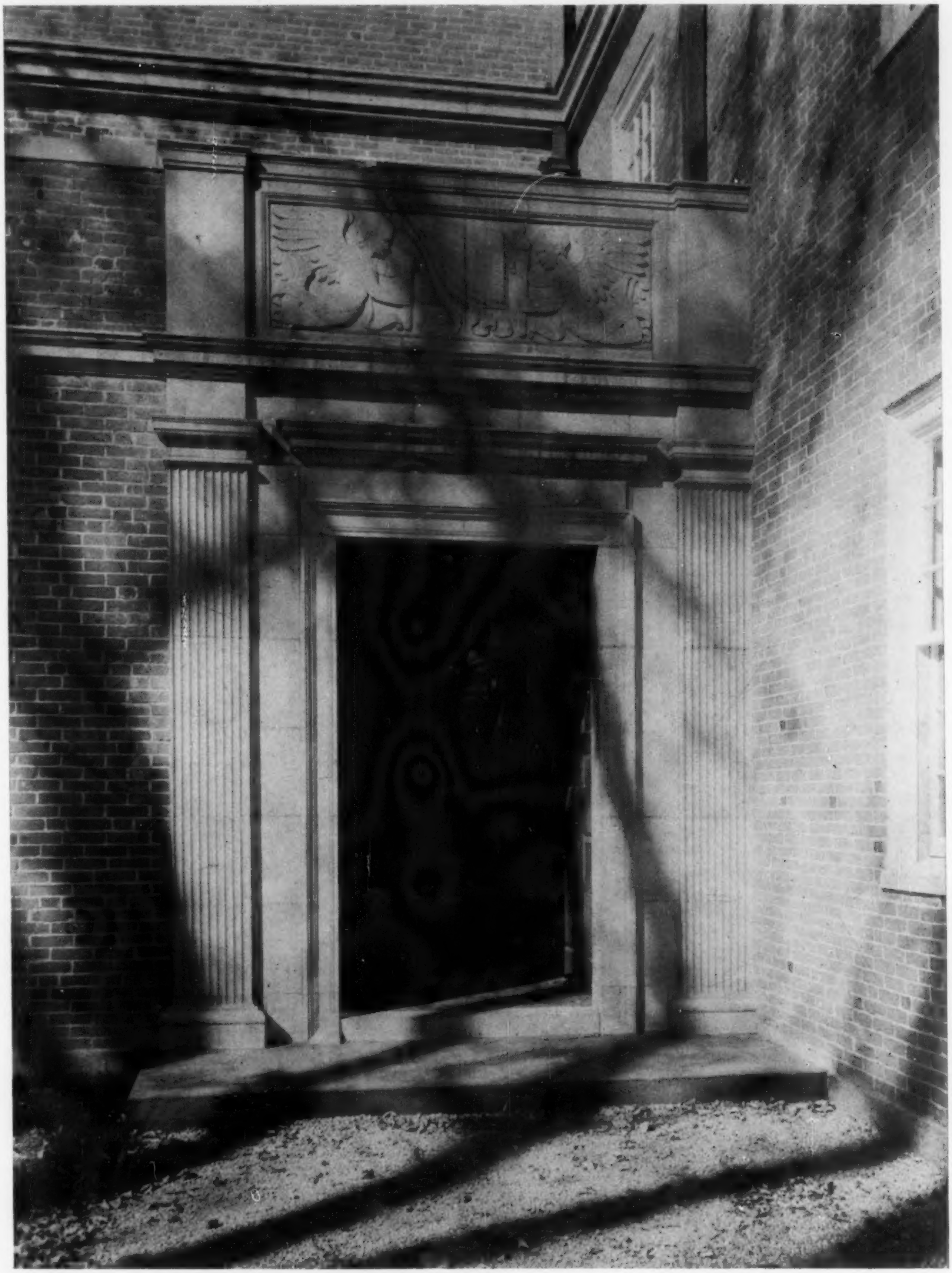


FIRST FLOOR

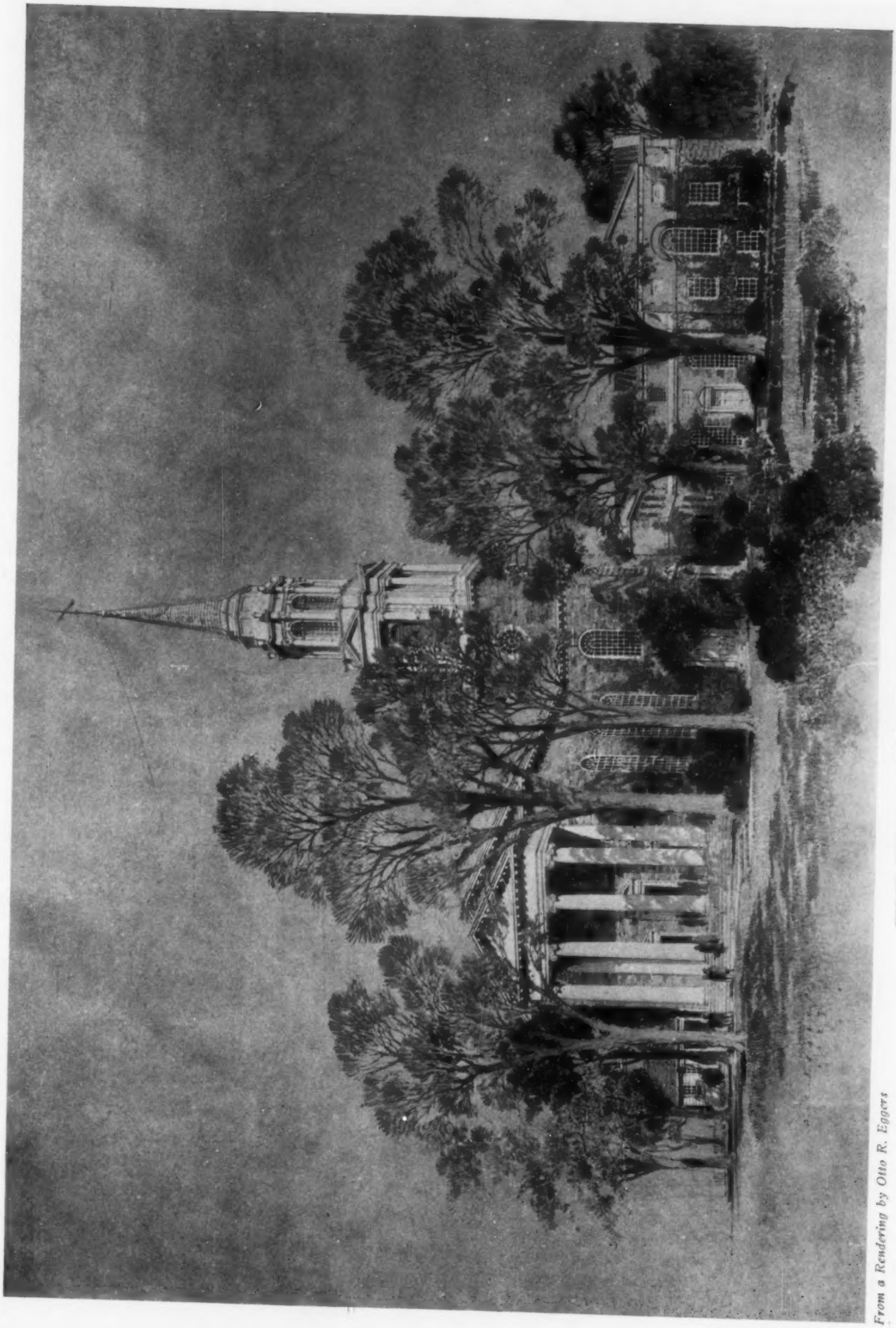
PLANS: ROXBURY LATIN SCHOOL, DEDHAM, MASS.

PERRY, SHAW & HEPBURN, ARCHITECTS

DETAIL, ROXBURY LATIN SCHOOL, DEDHAM, MASS.
PERRY, SHAW & HEPBURN, ARCHITECTS



ENTRANCE DOOR, ROXBURY LATIN SCHOOL, DEDHAM, MASS.
PERRY, SHAW & HEPBURN, ARCHITECTS



From a Rendering by Otto R. Eggers

Plans on Back

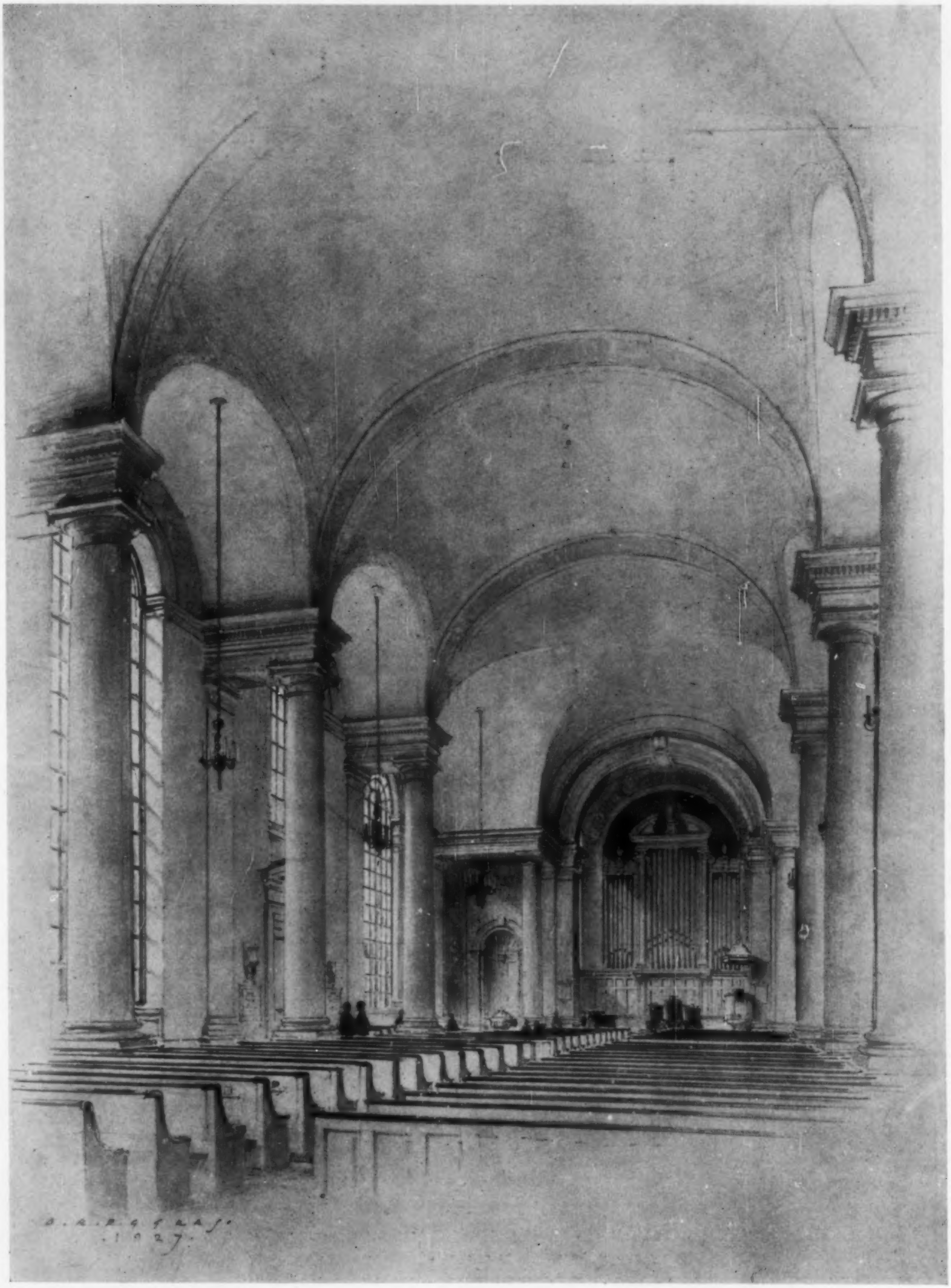
FIRST PRESBYTERIAN CHURCH, NEW ROCHELLE, N. Y.
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

BASEMENT

GROUND LAYOUT

PLANS: FIRST PRESBYTERIAN CHURCH, NEW ROCHELLE, N. Y.

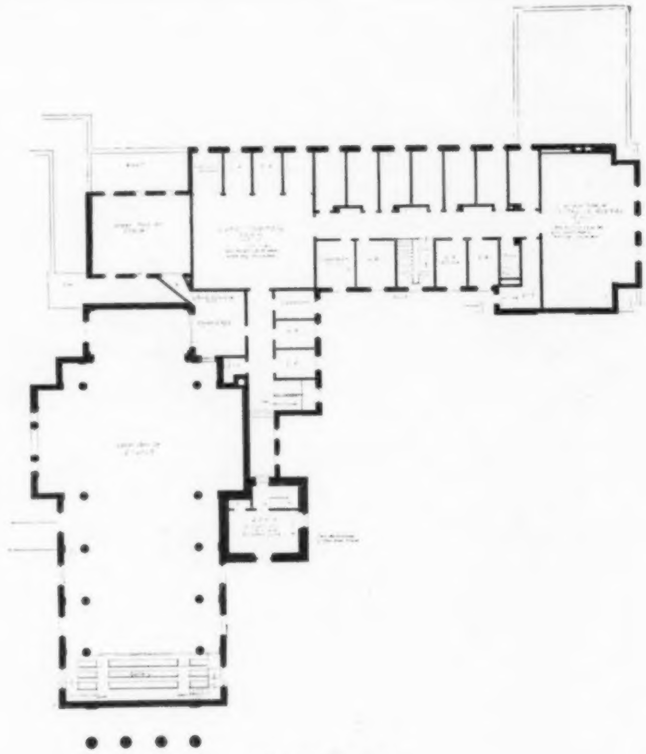
OFFICE OF JOHN RUSSELL POPE, ARCHITECT



From a Rendering by Otto R. Eggers

Plans on Back

FIRST PRESBYTERIAN CHURCH, NEW ROCHELLE, N. Y.
OFFICE OF JOHN RUSSELL POPE, ARCHITECT



SECOND FLOOR

FIRST FLOOR

FIRST PRESBYTERIAN CHURCH, NEW ROCHELLE, N. Y.

OFFICE OF JOHN RUSSELL POPE, ARCHITECT

OUTPOSTS OF ARCHITECTURE

MONUMENTS MARKING HISTORIC SPOTS ON THE GREAT NORTHERN RAILWAY

ELECTUS D. LITCHFIELD, ARCHITECT
BY
MATLACK PRICE

POINTS of historic interest have been marked, generally, in a very sporadic manner,—here and there and now and then. To carry out a consecutive program of marking a series of historic spots has been the unique and highly commendable plan of the Great Northern Railway. This railroad's president, Ralph Budd, sponsored the organization, in 1925, of the Upper Missouri River Historical Expedition, a tour of historians, writers and officials to historic spots where commemorative monuments were to be dedicated. And these monuments have not only been the means of paying a tribute to the hardihood of these early pathfinders who opened up the Pacific northwest, but also that of directing public interest to the historic background of the territory traversed by the railroad, extending through several states.

Much comment, certainly, was brought forth from northwestern newspapers. The *Spokesman-Review*, of Spokane, recognizing the practical aspect of the Great Northern's memorial building, said: "Getting away from the altruistic idea of bestowing honor where honor is due, there is a distinct advertising value in monuments and markers that actually recalls the scenes and facts of historical events. These make a peculiar appeal to the tourist. He is attracted by publicity concerning them, and the interest of his visit is enhanced by their perusal upon his arrival. It is good business to create and maintain shrines of

Monument to the Lewis and Clark Expedition at Meriwether, Mont.
Electus D. Litchfield, Architect

patriotism and historic significance," in which paragraph this newspaper made a very definite point, and showed itself to be more practical and less sentimental than most newspapers are when any kind of a memorial is being discussed. The *Minneapolis Journal* said: "Patriotism has no firmer foundation than a proper appreciation of the achievements of our predecessors." And the *Anaconda Standard* gives another angle of the thought conveyed by the paper in Spokane: "Sentiment has indeed come to be an integral part of the modern business structure. Sentimental considerations observed by many business institutions bring to them a measure of respect and sympathy,—a comradeship from the public,—that mere success and fair dealing cannot engender. Recent action of the Great Northern Railway Company in leading the way to a more general dissemination of knowledge of the early history of Montana

The Travel and Trade Route Monument at Bonner's Ferry, Idaho
Electus D. Litchfield, Architect

and the northwest is a sentimental business activity which is bound largely and vitally to benefit this commonwealth while redounding to the credit and increasing the respect for the railway company."

Considering the simplicity of pioneer ideals, of the lives of the men whose deeds are commemorated by the Great Northern's monuments, the architect, Electus D. Litchfield displayed admirable taste in the simplicity which is the keynote of his various designs. Nothing could be more appropriate than the sandstone shaft at Meriwether, Mont., marking the most northerly point reached by the Lewis and Clark Expedition in Lewis' detour to explore the Marias River. Although that famous expedition is much a matter of history, a paragraph or two here will be valuable. It was in April, 1805, that the expedition set out from St. Louis into really wild country, westward. Today, leaving Williston a traveler on the

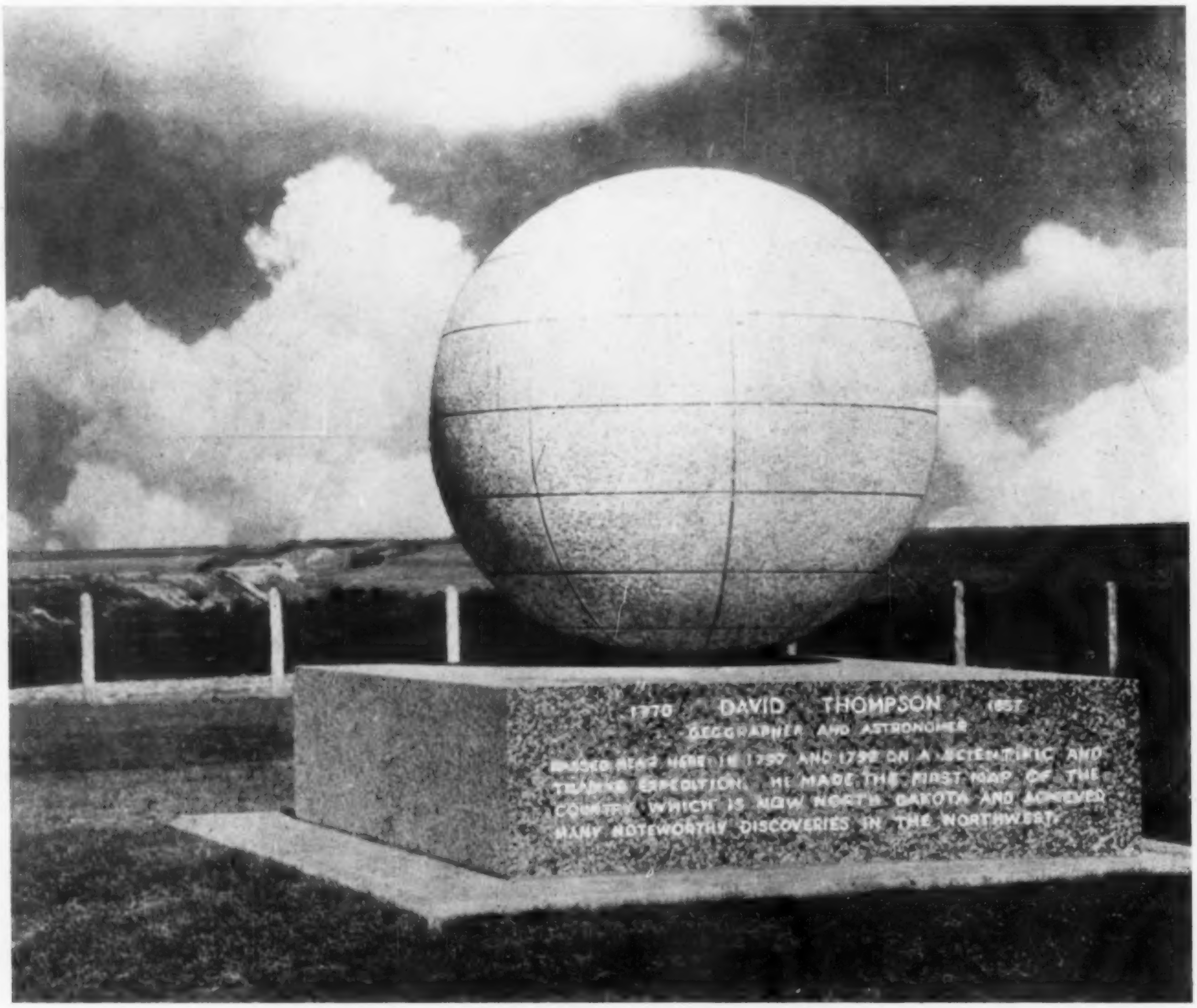
Monument to the Pioneers, Lewis, Clark and Thompson, at Wishram, Wash.
Electus D. Litchfield, Architect

Great Northern Railway follows very nearly the same route blazed by Lewis and Clark,—600 miles to Butte, one of the southern terminals of the railway,—but he covers the distance in 20 hours where the pathfinders spent four months of toil and privation to make it. But they were also making history. "This was the first official exploring expedition sent out by the American government. Its significance in our national history cannot be over-emphasized; where Lewis and Clark led, the population of an empire has followed." Returning from the Pacific coast, the party split into two separate exploring ventures. Lewis undertook to follow up the Marias River, which he believed to be an important tributary to the Missouri. When he reached a point where the Marias bent toward the southwest, he made camp. It was the most northerly point reached by the expedition, and about two miles west of the present station of Meriwether on the Great Northern Railway, which has marked it with a pink sandstone obelisk. The monument is characterized by simple, rugged dignity. On the base is inscribed: "Lewis and Clark Expedition, and on the shaft is carved:

July 26, 1806
Farthest Point West
on Capt. Lewis' Trip
Up The
Marias River

There is a fine dignity in this simple monument. In so vast an expanse of country the more ornamental aspects of architecture become trivial, and the architect does well to exercise the utmost restraint in design. This Mr. Litchfield certainly has done, and once more affirmed the axiom that good architecture must, necessarily, mean good taste and simplicity.

Somewhat in the same manner is the unusual monument at Wishram, in the state of Washington, near Glacier National Park, and on the Columbia River. On a plain base is mounted a dual column of natural formation, taken from a nearby cliff where these shafts break from the rock as though hewn by hand. Mr. Litchfield has relieved the severity of the natural rock with "lashings" as of rope, in bronze, and a bronze tablet with a list of 42 names is dedicated "To the Memory of those Dauntless Pathfinders and Pioneers Who Followed the Great Thoroughfare of



Monument to David Thompson at Verendrye, N. D.
Electus D. Litchfield, Architect

the Columbia at This Place." The first two names are those of Lewis and Clark, and the third that of David Thompson, that hardy cartographer and trader to whom a special monument stands at Verendrye, N. D.,—one of the most interesting of the series.

Much more conventional is the monument at Bonner's Ferry, Idaho, on the Kootenay. This spot, too, was visited by David Thompson, whose name heads a list of nine, below the inscription, which reads:

1808 1926
To Commemorate The
First Route of Travel
And Trade Across What
Is Now The State of Idaho

The bas-reliefs, modeled by Gætano Cecere, are elaborately symbolical,—a modern version of "attributes typifying the Indian and the pioneer,—most interesting in design and satisfying in scale and relationship. The whole idea of the monument is so simple that it easily carries this detail without being in any danger of seeming sophisticated or over-designed. Standing closer to the haunts of men than some of the other memorials, the spirit of the "great open spaces" is not felt as an essential in its character, as in the case of certain other monuments.

In a very different setting, however, is the monument to John F. Stevens at Marias Pass, which is the lowest northern pass over the Rockies. Here, at Summit, on the southern boundary of Glacier National Park, there stands a bronze figure of heroic size, commemorating a feat of personal hardihood not excelled by any of the great exploits of earlier pioneers which are recorded in these memorials.

On the base a simple inscription reads:

John Frank Stevens
December 11, 1889

Between those lines there is a story to read. In 1853 Marias Pass was sought by Isaac L. Stevens (not related to the subsequent discoverer), but he failed to locate it because a subordinate, to whom the venture had been assigned, returned unsuccessful, daunted by the superstitious refusal of the Blackfeet Indians to furnish a guide. This tribe had long believed Marias Pass to be infested with evil spirits, a belief still active when John F. Stevens came on the scene in 1889, destined to frustrate much effort.

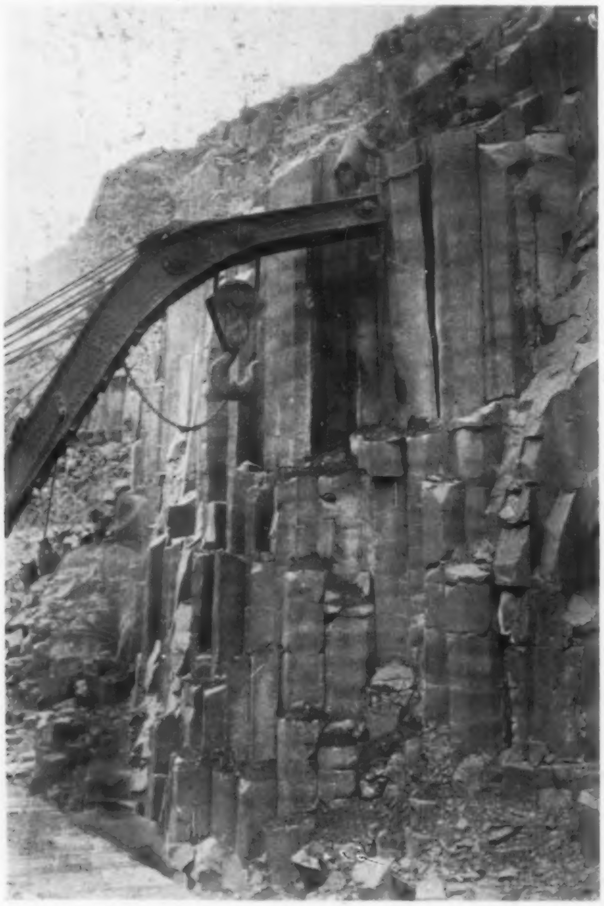
Monument to John F. Stevens at Summit, Marias Pass, Wash.
Electus D. Litchfield, Architect

The Great Northern, then known as the St. Paul, Minnesota & Manitoba, had got as far as Helena, Mont. and sought a pass of grade as favorable as possible to cross the Rockies and push on westward. John F. Stevens became principal assistant engineer in 1889, and soon chief engineer and general manager. And it was in midwinter, 1889, that he set out in search of Marias Pass, starting from Fort Assiniboine, seven miles southwest of the present city of Havre, on the Great Northern Railway. Unable to get a Blackfoot Indian guide who would brave the spirits. Stevens found a Flathead Indian who was willing, but within striking distance of the goal this man, too, refused to go on,—and Stevens went on alone. Some idea of the nature of the country may be had from the fact that Marias Pass had remained undiscovered by white men for more than a quarter of a century,—and now Stevens was able to lead his railroad across the mountains by a route which, from the engineer's viewpoint, is the lowest and best of all the passes in the northern states. The courage, the sheer hardihood of the man's achievement is expressed in the great bronze figure, facing resolutely forward on the trail,—a monument of inspiration, through the largeness and simplicity of its treatment.

At Verendrye, N. D. there is another monument. It consists of a large stone sphere, mounted on a plain plinth. The sphere is marked off with latitude and longitude, and its original design called for an applique of continents in bronze. On the base is set this inscription, which records these achievements:

1770 David Thompson 1857
Geographer and Astronomer
Passed here in 1797 and 1798 on a Scientific
and Trading Expedition. He made the First Map
of the Country which is now North Dakota, and
Achieved many Noteworthy Discoveries
in the Northwest.

It is a monument to a young lad from England, who went out at the age of 14 as an apprentice to the Hudson Bay Company. To a degree difficult for us to realize today, this lad roughed it in the fur trade, learning all he could about it while he was studying surveying. The greater part of his knowledge of surveying and the use of astronomical instruments he gained from an unambitious cartographer sent out by the Company. Unappreciated by the Hudson Bay Company, which, in this instance, seems not to have known when it had a valuable and highly talented man, Thompson quit and joined the great northwest in 1797. It was in that year the 49th parallel had been definitely agreed on as the boundary between Canada and the United States, and David Thompson at once went out to locate it. His exploits now stand commemorated in enduring stone, —another chapter in the history of the northwest.



Detaching the Twin Basalt Columns from a Cliff Near Wishram, Wash.

Preparing to Load the Twin Basalt Columns Onto the Flat Car

THE HOME OF THE GREEK REVIVALIST

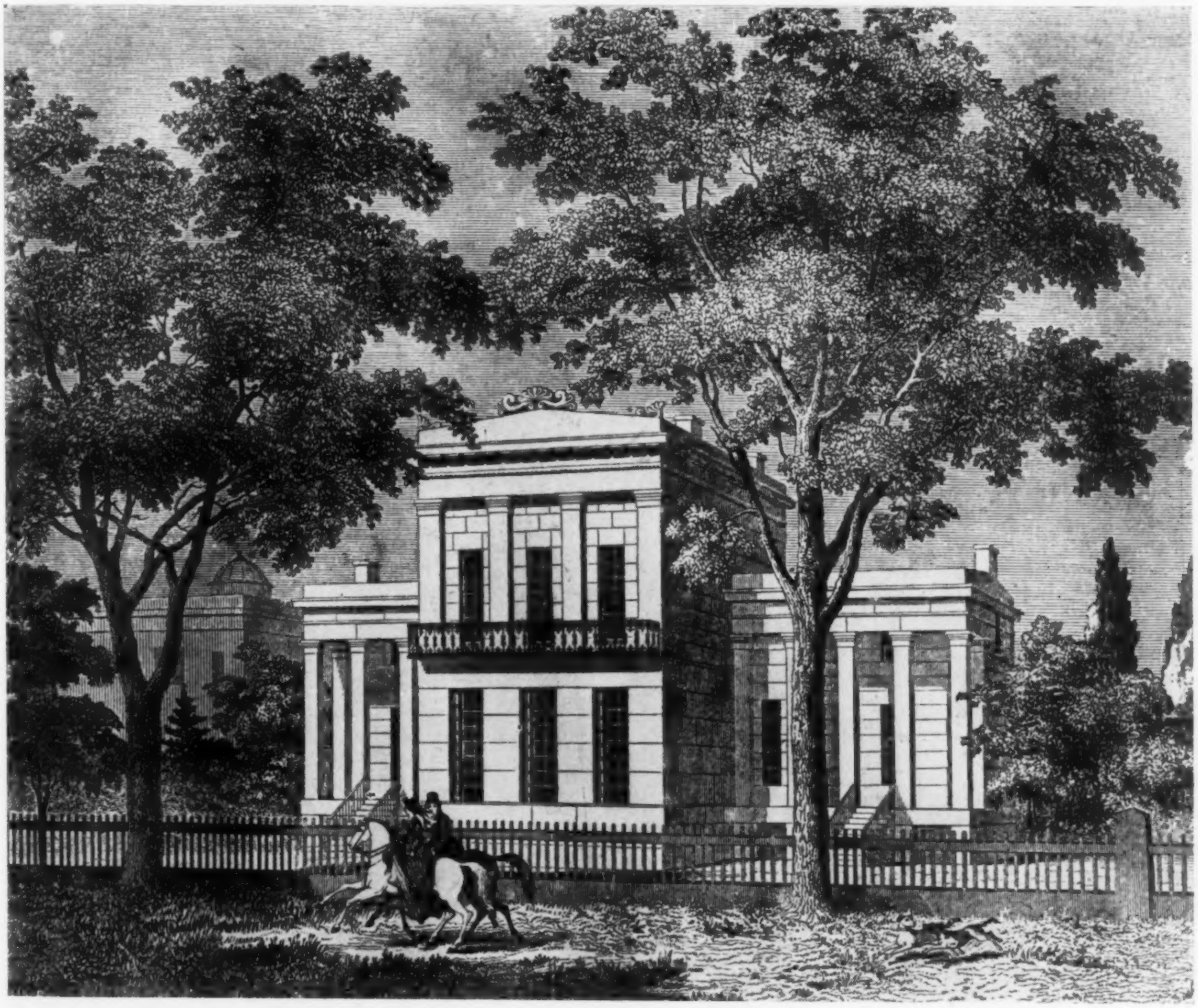
ITHIEL TOWN AT NEW HAVEN, CONNECTICUT

BY

THOMAS E. O'DONNELL

THE home that an architect designs and builds for himself generally commands more than usual attention. Because of the qualities and training an architect possesses,—or is supposed to possess,—we expect to see displayed in the design of his own home the real personal ideals of the man couched in the terms which he considers the proper expression of a man of taste. The architect who has made real progress has, as a rule, arrived at the place where he has a definite architectural philosophy, and he puts something of his own personality into his work. This personal vein may be apparent through the fact that he works in some purely personal style, or in some historic style through the variations and adaptations in which he finds it easiest to express himself. To the architect this becomes a real and serious matter, but to those about him this personal style is likely to appear as his hobby. It depends upon point of view.

It is now generally supposed that during the Greek Revival period in America,—that period between 1800 and 1850 when the popular architectural style was a revival of Greek forms carried out to the letter according to exact proportions and measurements,—all Greek Revival architects and builders were cold copyists and that they had but one ultimate ideal,—the Greek temple,—which it was their aim to adapt to all purposes. From this it has often been inferred that the supreme delight of a Greek Revivalist would be to live in a replica of a Greek temple of superb proportions and beauty, regardless of its utility as a private house. But we are not sure that such was the case. Little or nothing is known of the houses in which the Greek Revivalists, Latrobe, Strickland, Mills, Davis, Thompson, or Rogers, lived. However,



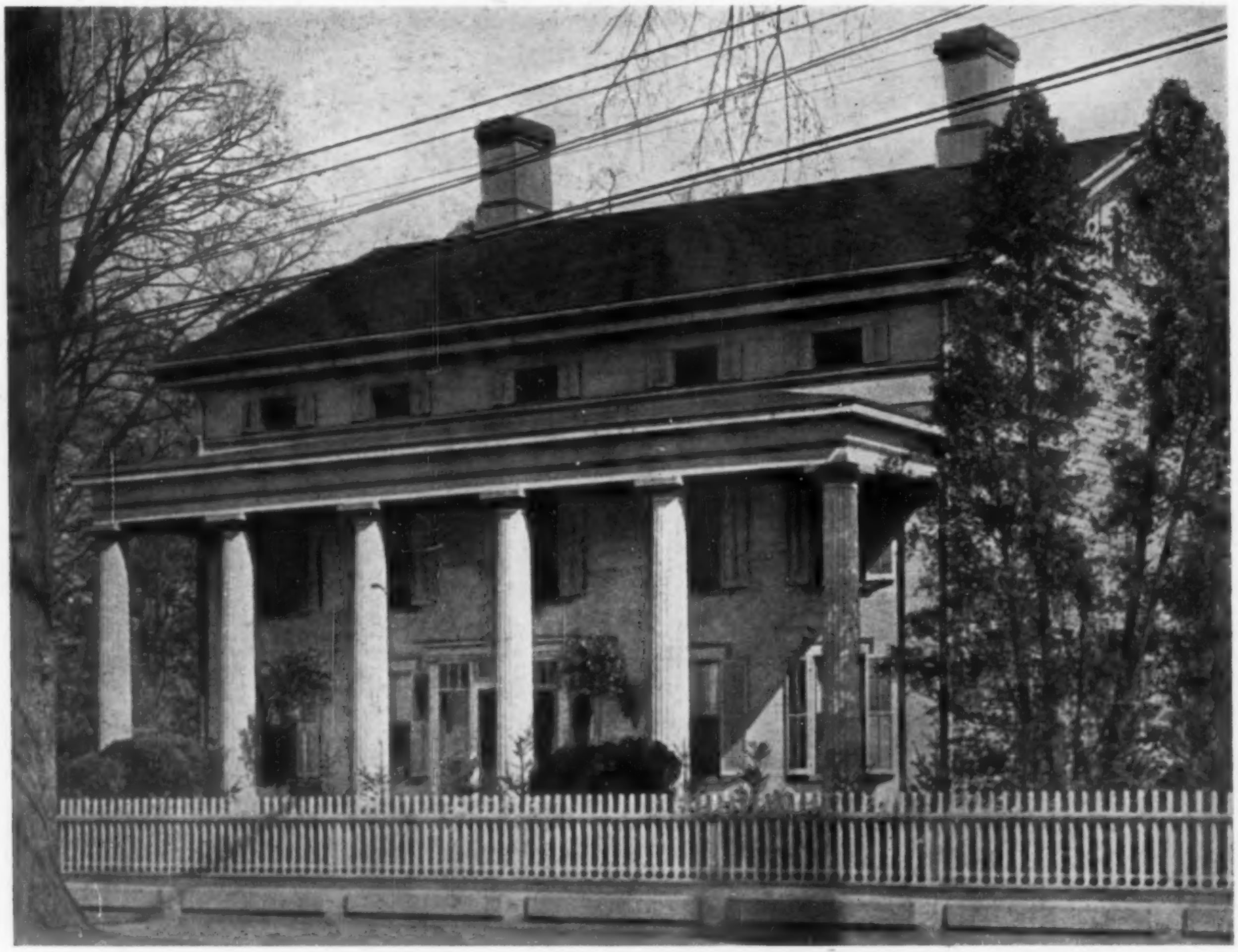
House in the Greek Revival Style Built at New Haven about 1835

From an Old Wood Cut Published in 1839

we are fortunate in having an old print, published in 1839, of the house which Ithiel Town built for his own home, in New Haven, a cut of which accompanies this article. This seems to clearly indicate that this Revivalist, at least, was not content to live in an adapted temple type but that instead built his house in the refined spirit of Greek work and not in a copied Greek form, and also that he was able to write into a stiff, formal style something of the domestic quality that is expected in a place of residence.

Ithiel Town began his architectural career, it seems, in the Connecticut Valley; at least it is recorded that he moved, in 1810, from Hartford to New Haven and was the first architect to reside there. What his architectural training and experience had been previous to this, we have no record. Whatever his training or ability, it was evidently sufficient to justify the people of his community in employing him as an architect for a number of prominent houses and churches there. Later he was the architect for the old state house, built about 1829, in Hartford, which is of a Greek temple type. In this same year we find his name appearing as one of the members of the firm, "Davis, Town & Thompson," with offices in the then new Merchants' Exchange building in New York. Whatever his connection with this very early and very prominent firm of architects, it seems that he still carried on work under his own name, for he alone is credited as being the architect for the old Indiana state house, at Indianapolis, which was under construction in 1834. During this same period, 1833 and 1834, he was also the architect of the North Carolina state house.

It seems evident that Town's practice carried him into widely separated fields, but his exact relationship to the New York firm and his place of residence are not so clear. Although he maintained some connection in New York with either Davis or Thompson, or both, from 1829 to 1844, it seems that he must have retained New Haven as his home, for as late as 1844 the New York Business Directory shows him to be associated with A. J. Davis with offices at "93 Merchants' Exchange," while we now know that he had built his Greek Revival home in New Haven in 1839, and that it is also recorded that he died in New Haven in 1844. From the few facts obtainable, it is evident that Ithiel Town's practice greatly resembled the modern architect's in the far separated location of work. Town must have been an architect of unusual ability to have been known from New Haven to Indianapolis. The primitive and slow methods of communication undoubtedly made the practice of architecture in those early times even more difficult and more trying than it is today.



Thaddeus Burr House, Fairfield, Conn., 1790. An Early Example of the Greek Revival

SMALL BUILDINGS

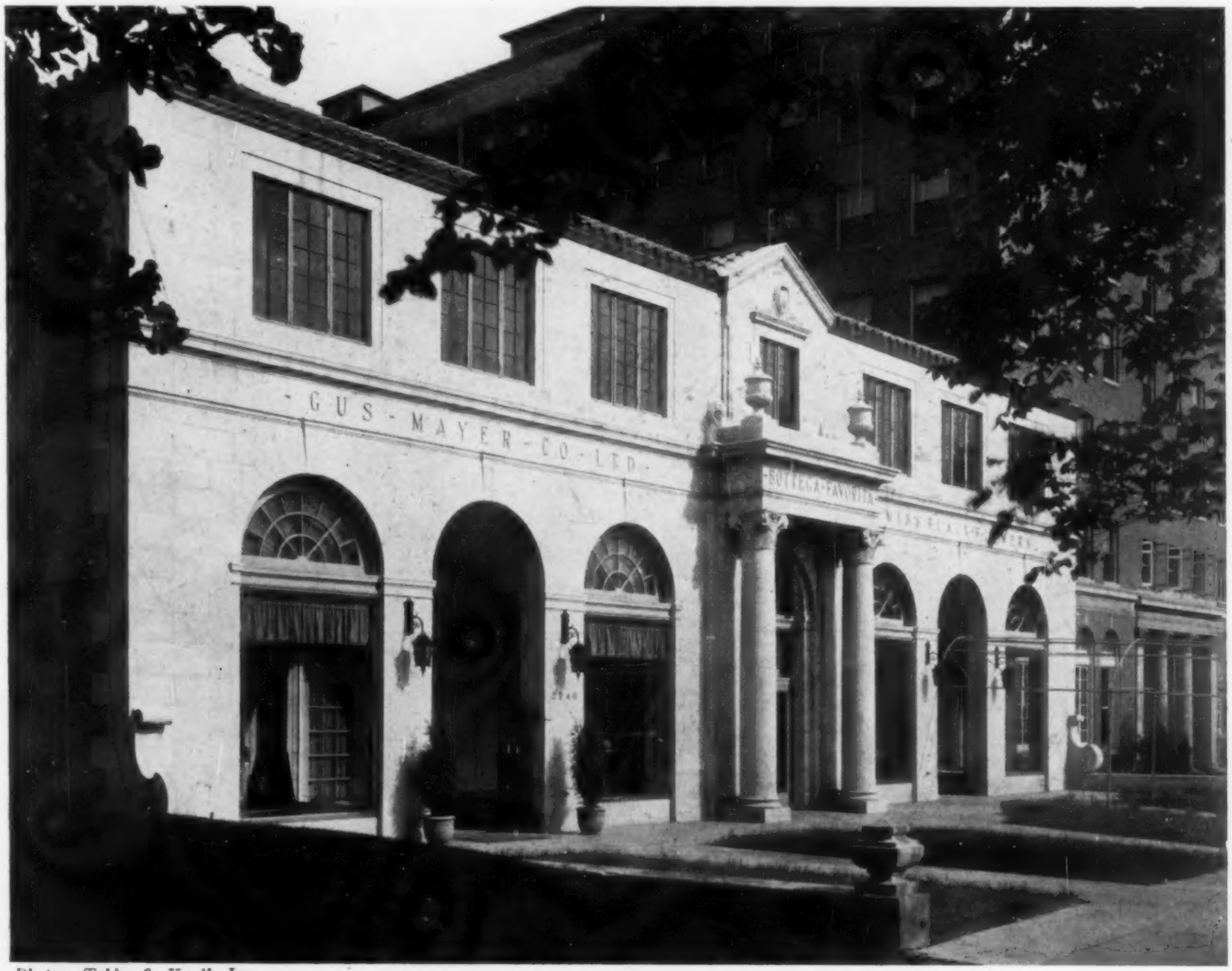
RECENT SMALL SHOPS

BY

KENNETH KINGSLEY STOWELL

THE measure of value in the architecture of small shops and stores is attractiveness. By this it is judged by the public, and attractiveness is interpreted in terms of dollars and cents by merchants. The latter, above all, are most directly concerned with the attribute of attractiveness which the architects can give to the premises; they must be able to attract people to their stores. Although the retailer may not be conscious of it, he probably carries in his mind an obsolete definition of the verb "attract," which Webster gives first, as "to draw or drawn in, as by suction." That does express his wish. He surely would use the word in the sense "to draw by influence of a moral or emotional kind; to engage or fix, as the mind, attention and so forth; to invite, to lure, as to attract admirers." Without such attractiveness his business cannot hope to prosper. There is ample evidence to support this, and such evidence may be seen on all our city streets from Maine to California and from Florida to Oregon. Certainly the illustrations reproduced herewith will bear this out.

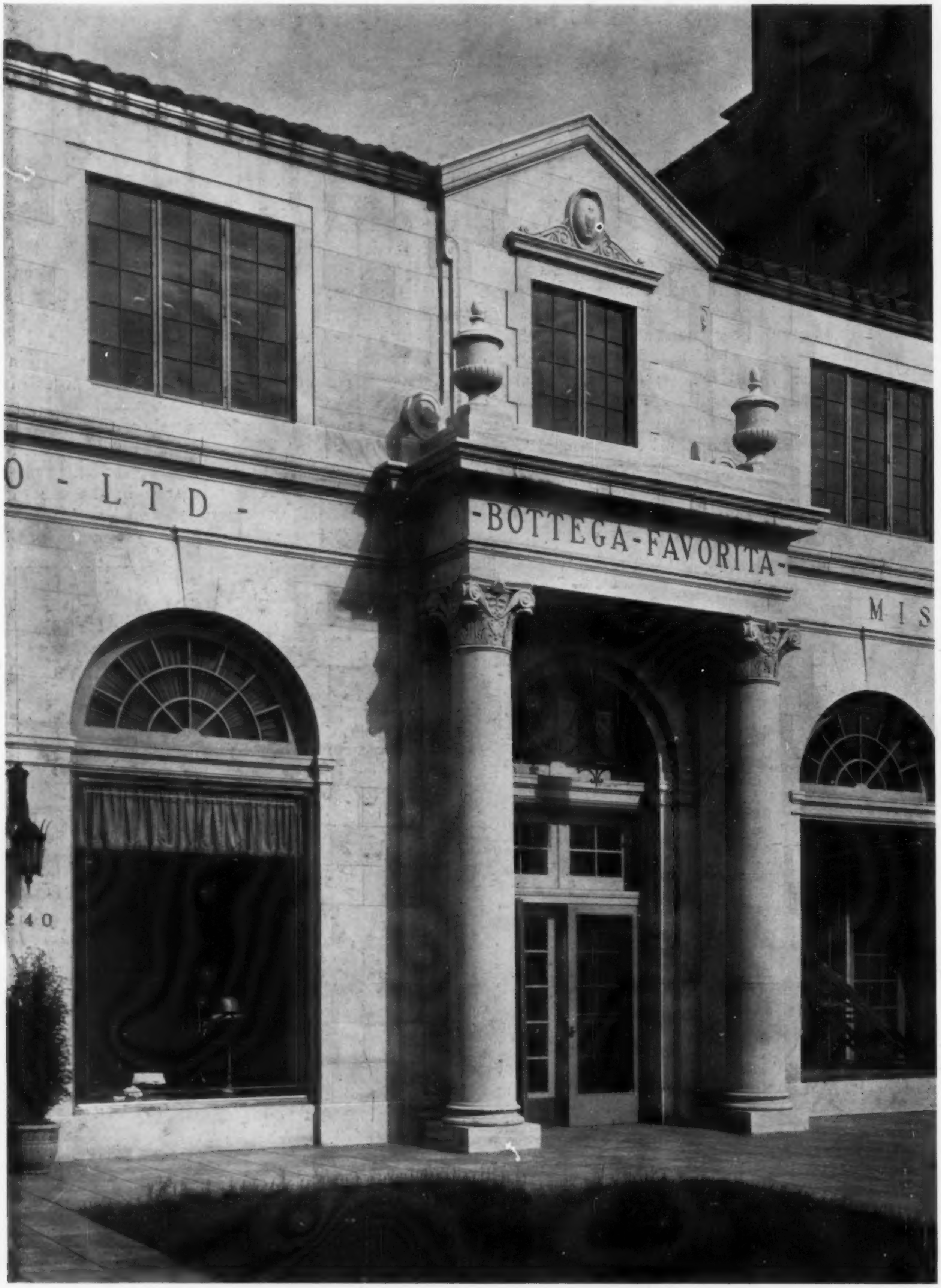
Attractiveness in retail stores is not confined to any time or place or to any period or style. There has been a recent renaissance of good design in buildings of this character throughout the United States. One of the chief features, perhaps, in this development has been the successful effort to design buildings which are appropriate to the purposes of the stores and which, in some way, reflect the character of the merchandise for sale therein. All styles and all periods of architecture have contributed their share to the inspiration of the architects of the present. We find the greatest latitude in the use of precedent, as architects are not fettered with tradition but use it freely and with imagination to pro-



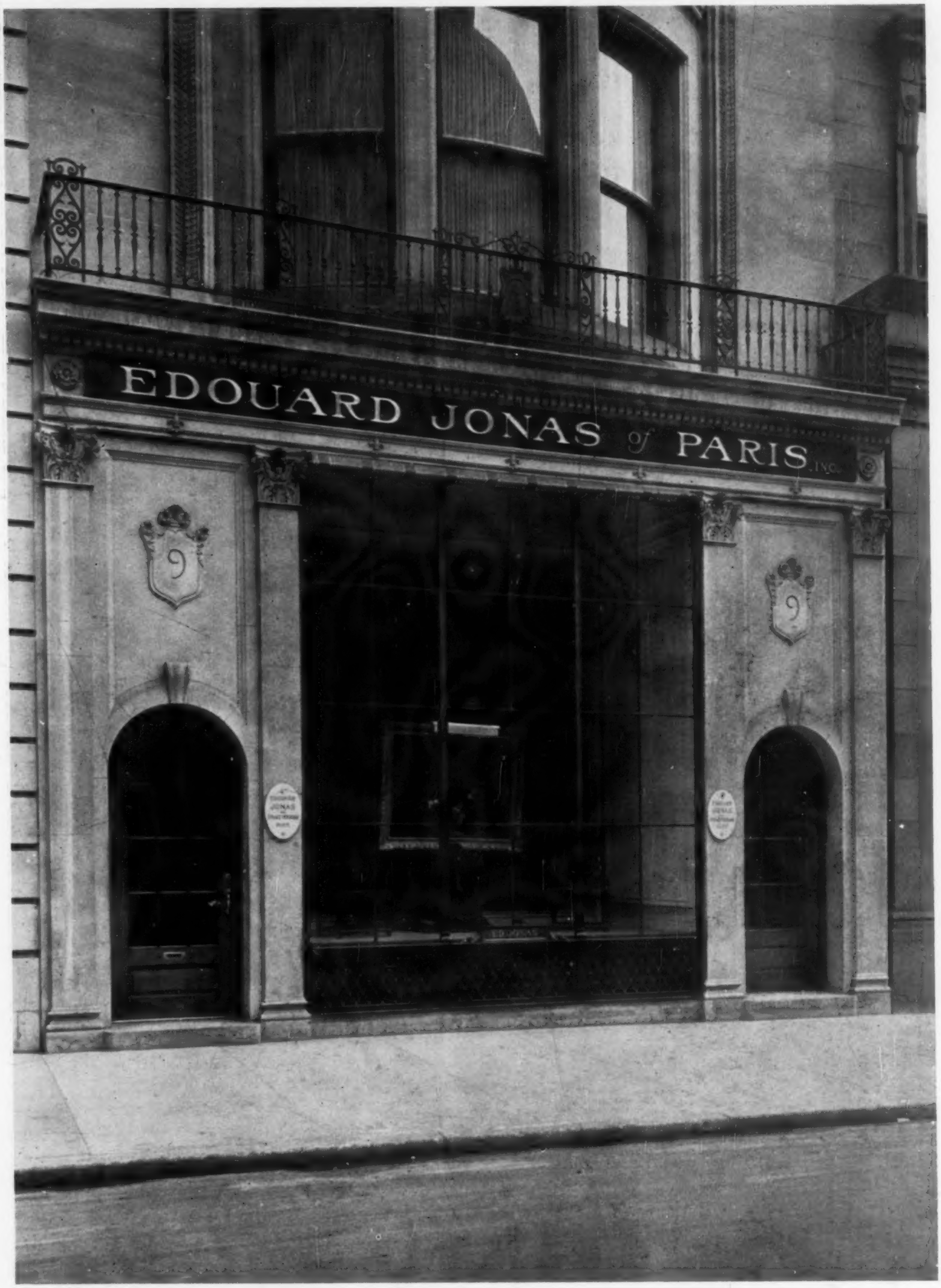
Photos. Tebbs & Knell, Inc.

Tutwiler Stores, Birmingham, Ala.

Warren, Knight & Davis, Architects



DETAIL, TUTWILER STORES, BIRMINGHAM, ALA.
WARREN, KNIGHT & DAVIS ARCHITECTS

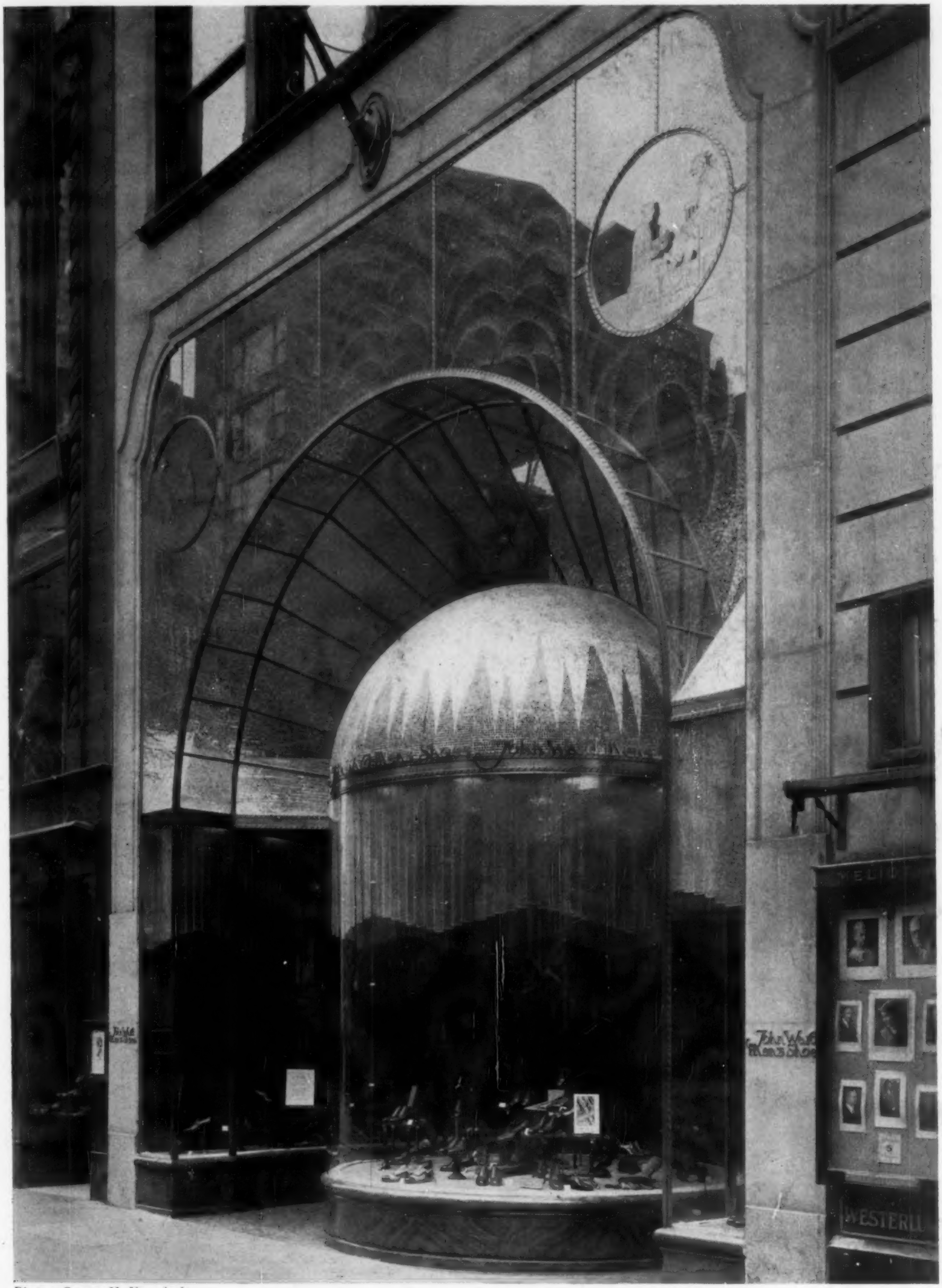


Photos. Paul J. Weber

RECENT SHOP FRONT AT 9 EAST 56TH STREET, NEW YORK

GREVILLE RICKARD, ARCHITECT

SHOP FRONT AT 23 WEST 51ST STREET, NEW YORK
FRANK A. GOODWILLIE, ARCHITECT



Photos. George H. Van Anda

THE JOHN WARD SHOE SHOP, FIFTH AVENUE, NEW YORK

RICHARD H. SMYTHE, ARCHITECT

INTERIOR OF THE JOHN WARD SHOE SHOP, FIFTH AVENUE, NEW YORK
RICHARD H. SMYTHE, ARCHITECT

PERFUME SHOP IN THE MODERN FRENCH STYLE, FIFTH AVENUE, NEW YORK
JOHN FREDERICK CONAN, ARCHITECT

Front of the Interior of the Delettrez Shop

Rear of the Delettrez Shop, Fifth Avenue, New York

duce the desired result,—attractiveness. In order to attract, it is felt that a shop must be different from its neighbors; it must be easily distinguishable from the others around it. This accounts for the great diversity in style and material to be found in the shop fronts on every street. Fifth Avenue is lined with shops, each differing from the others, each striving to appeal to those who pass and to attract them not only to their windows but inside. Every town or city has its Fifth Avenue, be it called Michigan Boulevard or Main Street, where small shops vie with one another to lure the prospective purchaser.

The attractiveness of the exterior is carried consistently throughout the interior in the modern shop. The "false front" is no longer enough to attract and hold the buying public. The appointments of the interior must continue to enhance the attractive impression given by the shop's exterior. That architects have been able to accomplish results which not only satisfy their own æsthetic taste but which contribute a determining factor in successful merchandising, is evinced by the ever-growing number of architecturally designed shops and stores. The appeal to the æsthetic is being recognized more and more wherever merchandise is bought and sold. More articles are being sold on their design appeal than ever before, and it is important that they be given their proper setting. The show window should be designed primarily to be the proper setting for the articles for sale within. The best of window dressers cannot succeed in displaying his wares without the proper architectural enframement, which the architect alone can give. Another element in the attractiveness of the small store is the appropriateness of the design to the character of the business, and we find this element is seldom, if ever, lost sight of by the architect. There are several good examples of this among the illustrations chosen. Certain classes of shops demand a more or less formal style of architecture; others demand a more intimate setting and surroundings. We have chosen examples of both kinds from many places. They show shops designed for the sale of many different articles, from cosmetics to clothing, from rugs to music.

The first example is of a building which by its refinement of detail and carefully selected materials bespeaks the character of the shops which it houses. It is essentially a building for shops that might be termed by the trade "high class specialty shops." If such a shop had merely one great glass front, it would have far less character and be far less effective in attracting patrons. The chaste and dignified arches make enframements for the display of show windows that add immeasurably to the interest of the articles exhibited. The architecture is formal and dignified without being cold. This is largely due to excellence in proportions and to careful consideration given to the profiles and the mouldings. The slight

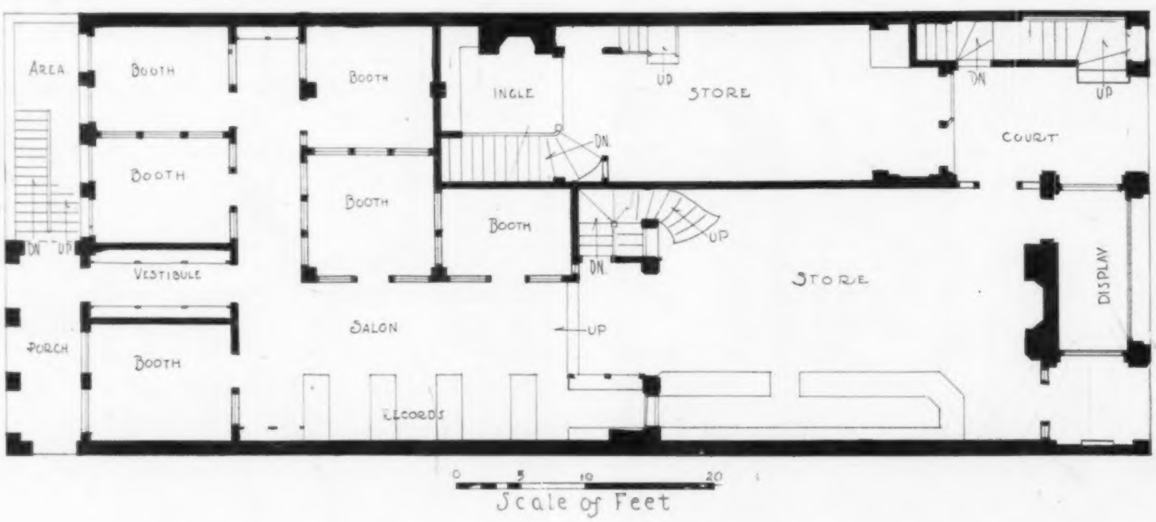
STREET FRONT OF MRS. FRANKLIN'S SHOP

SHOP FOR MRS. FRANKLIN, INC., PHILADELPHIA

TILDEN, REGISTER & PEPPER, ARCHITECTS

Photos. Trowbridge

MERCANTILE AND APARTMENT BUILDING, WINNETKA, ILL.
HAMILTON, FELLOWS & WILKINSON, ARCHITECTS



PLAN OF A SHOP IN THE CENTER OF THE BLOCK

Center Detail of the Mercantile and Apartment Building at Winnetka, Ill.

Corner Detail of the Mercantile and Apartment Building, at Winnetka, Ill.

projection of the keystone, which gives just enough relieving shadow, is especially noteworthy.

Many small shops have invaded residence streets and have called for alterations in older buildings. An interesting example of a successful alteration is shown in the illustration of the shop of Edouard Jonas, of Paris. The material chosen for the shop front is the same as that of the rest of the building, and the shop window has been placed in the center of the facade, recalling the large windows in the older portion of the building above. The railing above the cornice breaks what might be too sharp a line of demarkation, and forms a pleasing transition from the new to the old. The use of two symmetrical doorways might be criticized as confusing to a possible purchaser, since one door probably leads to the store and the other to the floors above.

An excellent example of the appropriateness of architectural treatment and ornamentation to the character of the store is shown in the imaginative little building for Tupper & Reed, of California. The trumpeter on the chimney seems to announce that music is the commodity on sale. A harp adorns the chimney farther down, and one almost expects birds to be singing in the little dovecote at the point of the roof. The plaque from Della Robbia's "Singing Boys" heightens this musical character. It will be noted in one of the smaller details illustrated, that even the name of the little restaurant, "The Piper," has been chosen to harmonize with the setting. In striking contrast are the unattractive stores at either side. Although this may seem to be carrying appropriateness to the *n*th degree, one must acknowledge the gain in attractiveness.

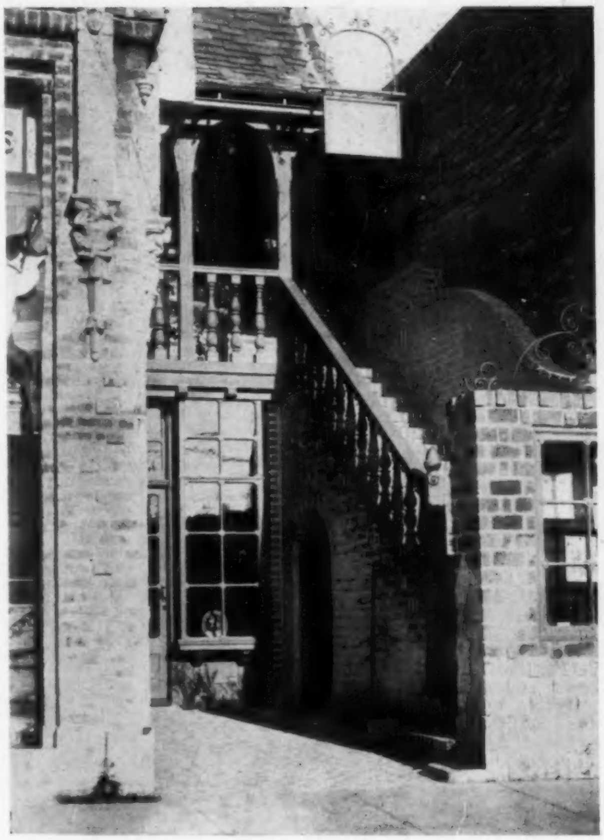
There are other examples of the more intimate types of small shops,—one a restaurant, "The Cloisters"; another a smart clothing shop in Philadelphia. In both of these shops the design is based on English precedent, and the results are achieved by the simplest means. Both use comparatively small panes of glass in the windows, divided by muntins that give scale to what otherwise might be an "aching void." Too often large sheets of plain, clear glass give such an effect. One can easily visualize the entire lack of character and the irreparable loss in attractiveness that would result if the present windows were replaced with single large sheets of glass. All distinction and all "scale" would be lost. The same would be true in the case of the shop of Henry V. Weil. In the latter, of course, the muntins are a practical as well as an æsthetic consideration, because a single curved sheet of glass would probably have had to be made to order at considerable expense, and would be difficult to replace.

The difficulties just mentioned are not deterrents where the use of curved glass is absolutely necessary in obtaining the desired effect. Modernist designers will make their materials fit their needs. One of the most recent examples is the Ward shop on Fifth Avenue, New York. Here glass is used in a multi-

Photos. Ford E. Samuel

TUPPER & REED MUSIC STORE, OAKLAND, CAL.
W. R. YELLAND, ARCHITECT

INTERIOR OF THE TUPPER & REED MUSIC STORE



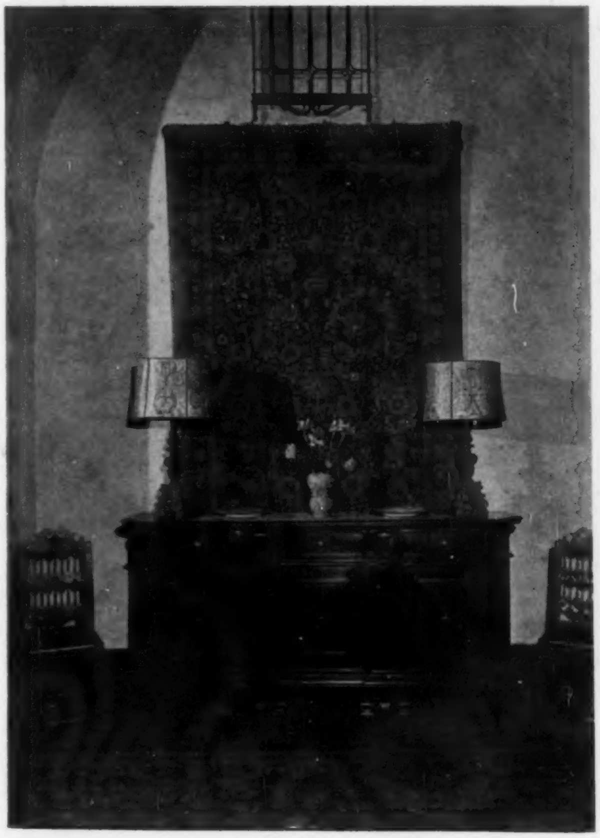
STAIRWAY TO THE UPPER RESTAURANT

ENTRANCE DOOR IN SIDE COURTYARD

Photos. Drix Duryea

INTERIOR OF WHITTALL'S RUG SHOP, NEW YORK
OFFICE OF JOHN RUSSELL POPE, ARCHITECT

ALCOVE IN WHITTALL'S RUG SHOP



ANTIQUES USED TO SET OFF RARE OLD RUGS

RUGS DISPLAYED IN AN ARTISTIC SETTING

tude of interesting forms. The central case is cylindrical, so that one may view the display from all sides. The semi-circular dome above is of gold and silver mosaic glass, and there is a brilliant background of silvered glass mosaic that makes a myriad-faced mirror of all the surfaces behind the central horizontal band of the design. Even the "drapes" suspended from this band are strips of glass of an interesting texture. The medallions are of cut sheet bronze and show a shoe-fitting scene. The interior is supplied with individual chairs designed along modern lines, and the sweep of the chair arms is in keeping with the roundness of the exterior design. On the walls of the customers' portion of the shop are some most interesting bizarre decorations in flat tones, very modern and exceedingly clever. Certainly such decorations are more attractive than the usual tiers of monotonous shoe boxes.

The shop of Delettrez is an admirable example of modern French design. It is characteristic of the distinctive shops found along the Rue de la Paix. Dark veined marble is one of the favored materials for such shops, embellished with bronze, silver and gilt bas-reliefs. The restrained richness and the refinement of these designs are intended to suggest superior wares and undoubtedly are assets of no mean value to the shopkeepers. The small scale of the show windows adds to the effectiveness of the display of the exotic little jars and bottles.

The interior of the shop which is known as "Whittall's Salon" is admirably designed to set forth the beauty of the rugs. The rugs demand accessories such as furniture and lamps to give an idea of their proper setting, approximating their proper use in the home. They have been admirably chosen. The textured walls make a fitting background for the soft richness of the rugs hung against them, and the tile floors are in pleasing contrast with the fabrics that cover them. Here again we find the architecture in scale with the product for sale. The larger rooms provide the proper settings for the rugs of ample sizes, and a most pleasing paneled alcove shows the use of the smaller rugs to advantage.

Very often an architect is called upon to design a building containing a row of stores that will be rented. Naturally in this case his problem is to design the shop fronts so that they will be attractive yet adaptable to the display of various kinds of merchandise. A successful solution of this problem is shown in the illustrations of the group at Winnetka.

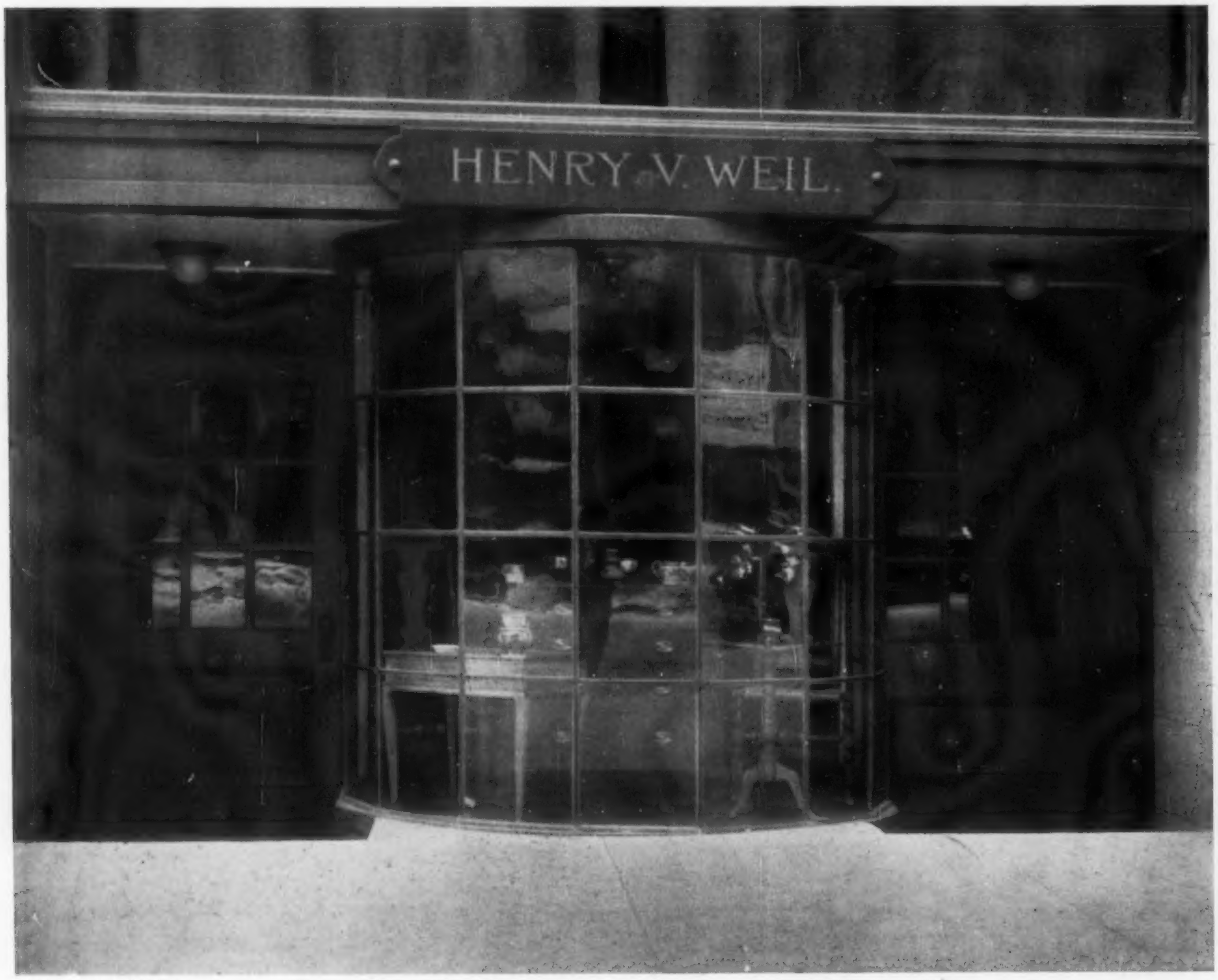


Photo. Paul J. Weber

Georgian Precedent Used for Modern Shop Front

INTERIOR ARCHITECTURE

DETAILS FROM THE FRENCH CHATEAUX

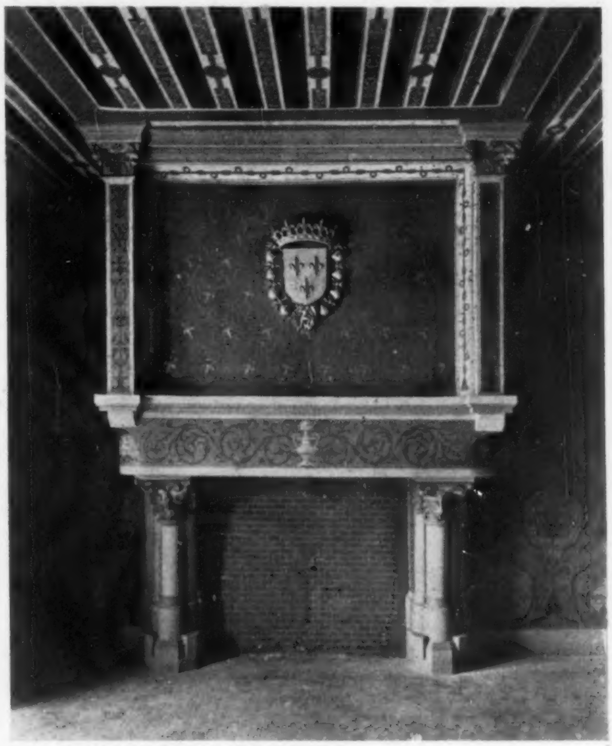
MEASURED AND DRAWN BY
ALBERT A. CHADWICK
TEXT BY
PARKER MORSE HOOPER

THE unusual interest shown in the series of measured details from some of the lesser known French city houses by C. Hamilton Preston prompted THE ARCHITECTURAL FORUM to commission Albert A. Chadwick to procure and prepare for it a similar series of measured details from the French chateaux. Although the beautiful examples of Francis I and Henry IV architecture in Touraine have been constantly photographed and frequently described, there seems to be no English publication presenting illustrations and measured details of some of the more important examples of these interesting and fascinating examples of French architecture. It is hoped that architects in this country will find this series of chateau details not only of interest and inspiration but also of service for adaptation in their free expression of modern architecture, which use is splendidly illustrated in the ornamentation of the New York Life Insurance Building, by Cass Gilbert.

Because architectural design all over the world is undergoing a great change and because a new and freer expression, more individual and more original than has been known in several centuries, characterizes modern work in all the arts, there is no reason why precedent should be completely abandoned. By far the best and most conservative and satisfying examples of modern architectural design in Europe today are those in which architectural precedent is at least suggested, if not actually and accurately followed, in the architectural forms and details. Such buildings as the Town Hall and the Concert Auditorium at Stockholm are excellent examples of this new and freer use of the architectural styles of the past. In the Town Hall there is distinct evidence of the influence of Byzantine and Romanesque architecture. In the Concert Auditorium a new and original use of Greek architectural forms is evidenced. In the best of recent architectural design in this country a suggestion of one or another of the periods of the past is seen at least in the architectural ornamentation. Greek, Assyrian, Phœnician and Egyptian ornament and devices are used in new arrangements and fresh forms.

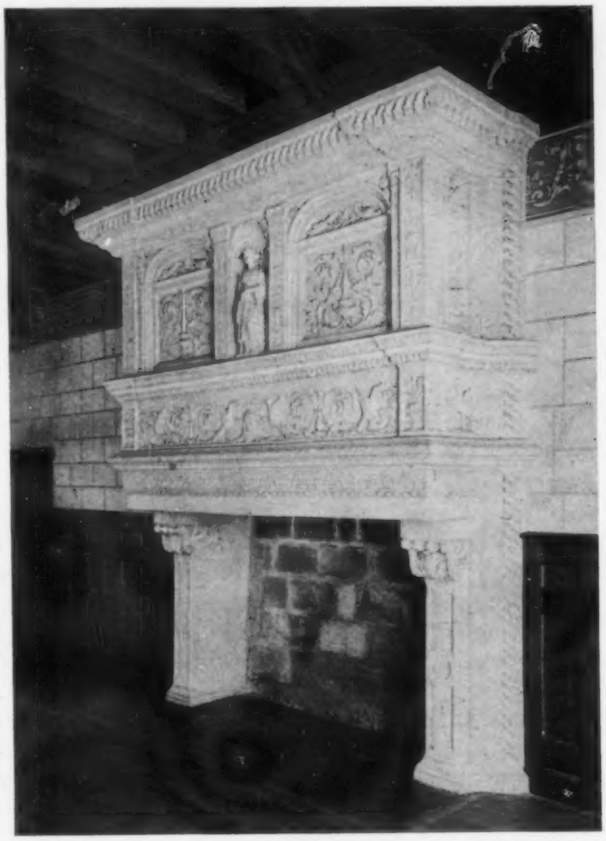
To the appreciative and conscientious student of architectural history the fact is undeniable that each new period of architectural development is a natural outgrowth from the period preceding. In character each period may be quite different from its predecessor, but certain characteristics follow through, though they may appear in a somewhat changed form.

Chimneypiece, Chateau de Blois, Francis I. Period



Chimneypiece, Chateau de Blois, Francis I. Period

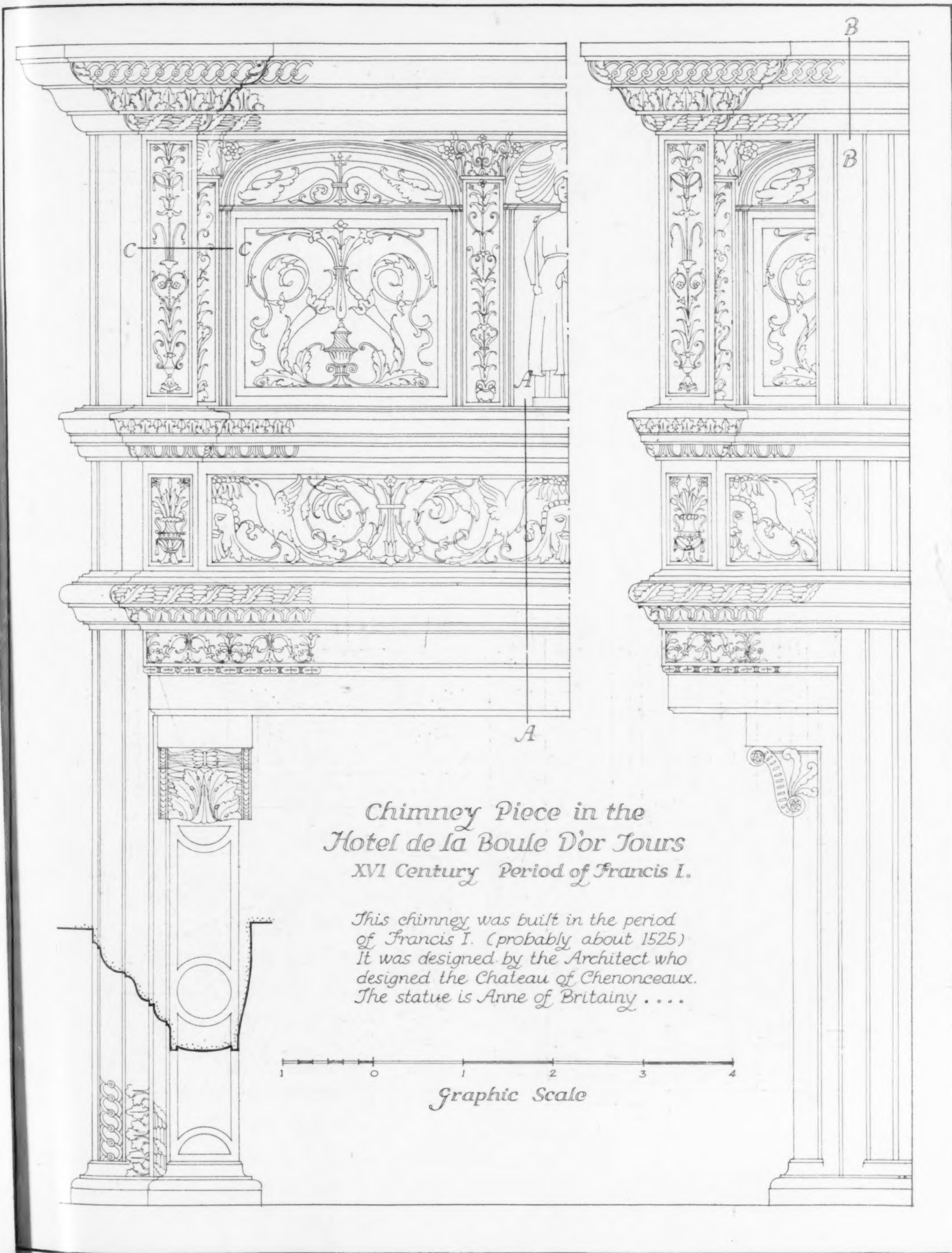
DOORWAY, CHATEAU DE BLOIS



CHIMNEYPIECE, HOTEL DE LA BOULE D'OR

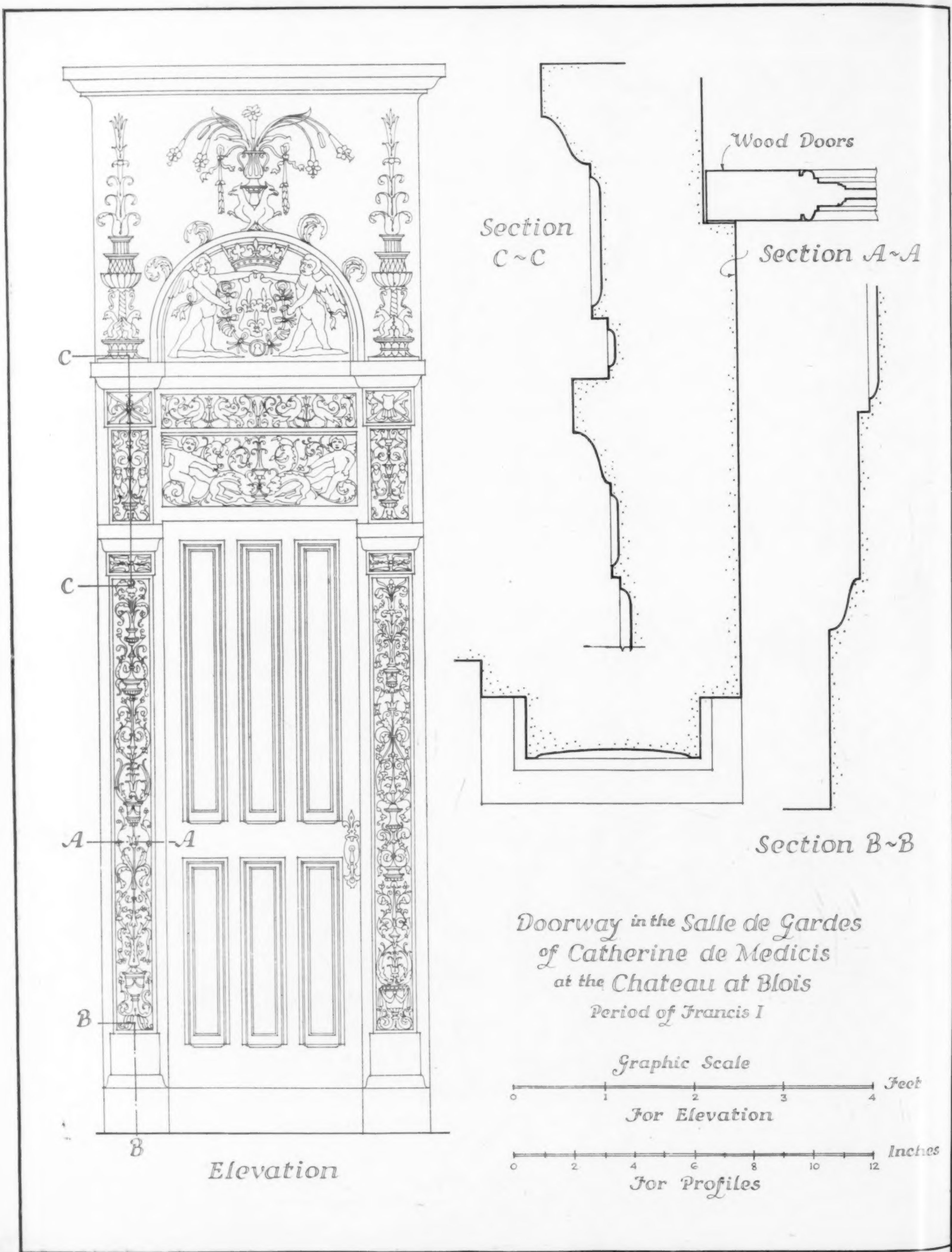
DOORWAY, SALLE DES GARDES, CHATEAU DE BLOIS

DOORWAY, CHAMBRE DES GARDES, CHATEAU DE BLOIS



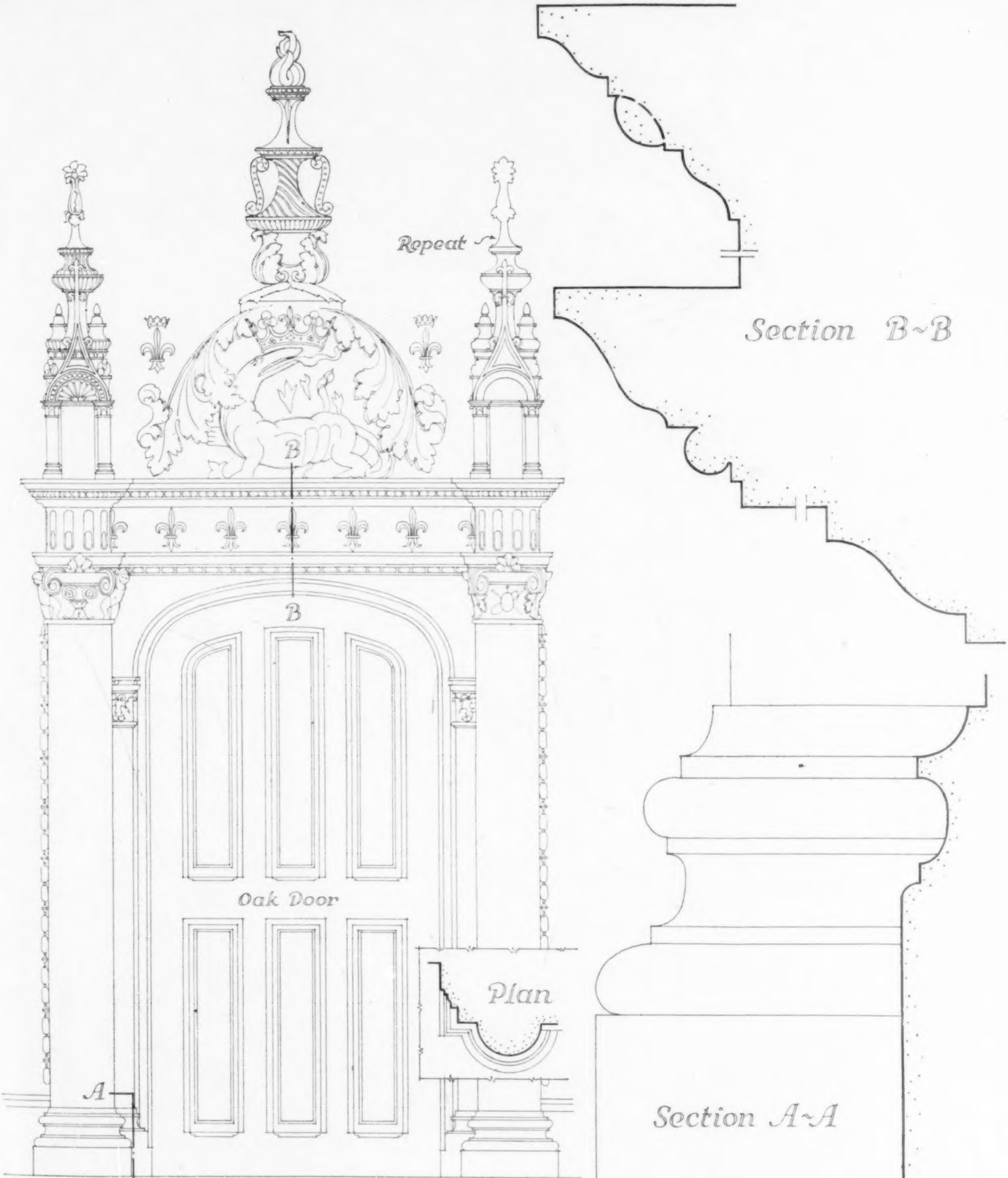
Chimney Piece in the
Hotel de la Boule D'or Tours
XVI Century Period of Francis I.

This chimney was built in the period
of Francis I. (probably about 1525)
It was designed by the Architect who
designed the Chateau of Chenonceaux.
The statue is Anne of Britainy . . . .

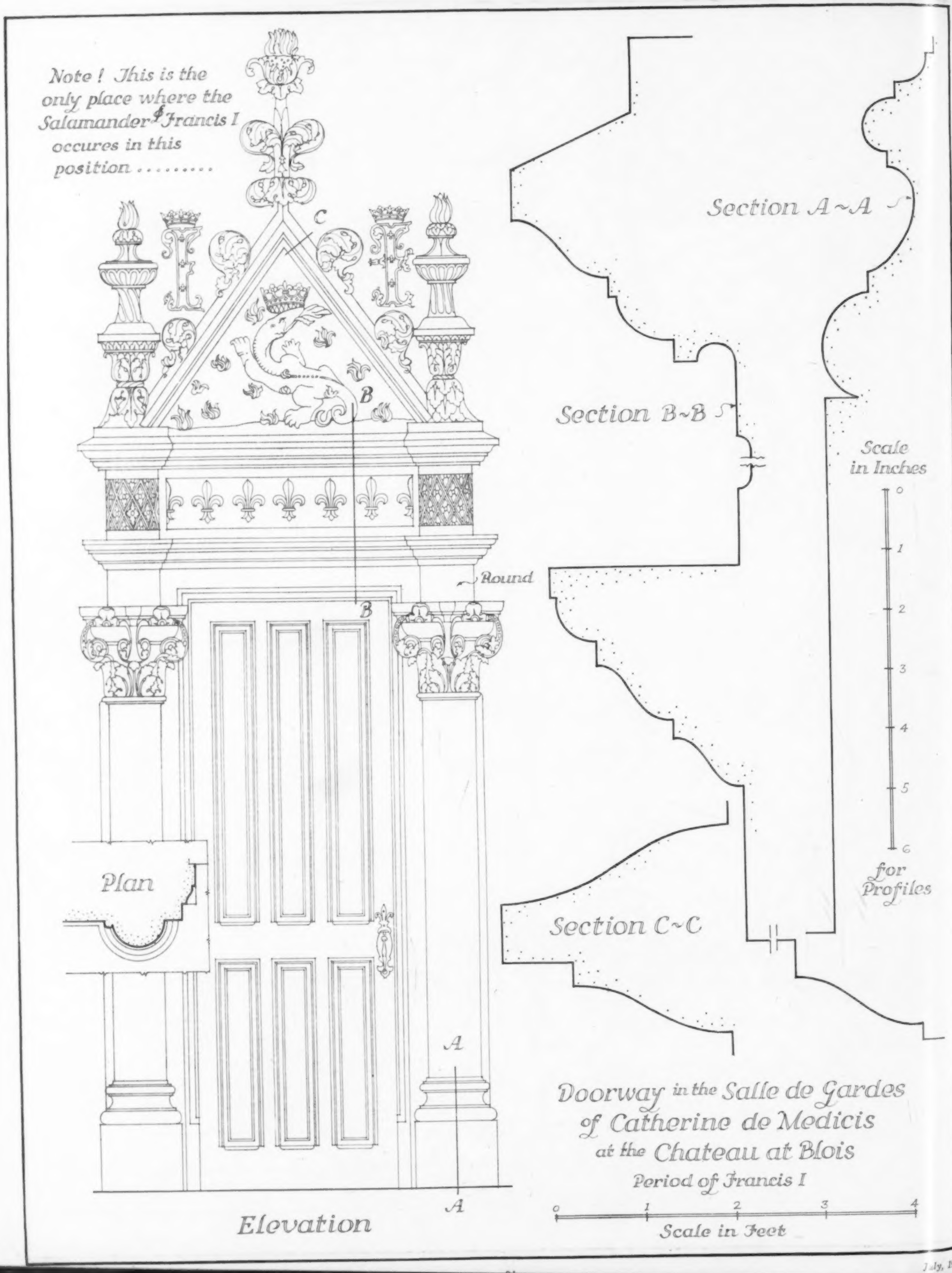


Doorway in the Salle de Gardes of Catherine de Medicis at the Chateau at Blois

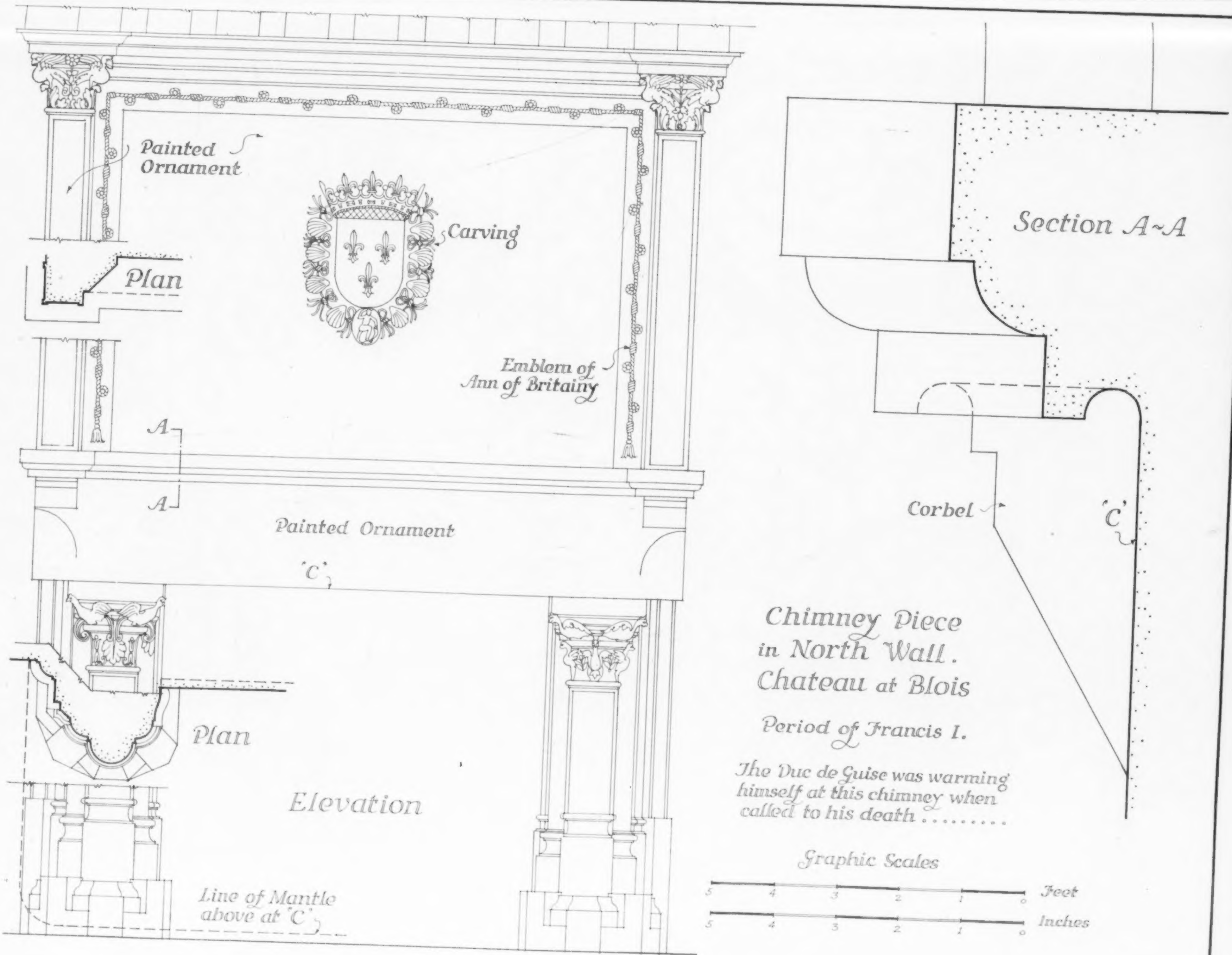
Period of Francis I

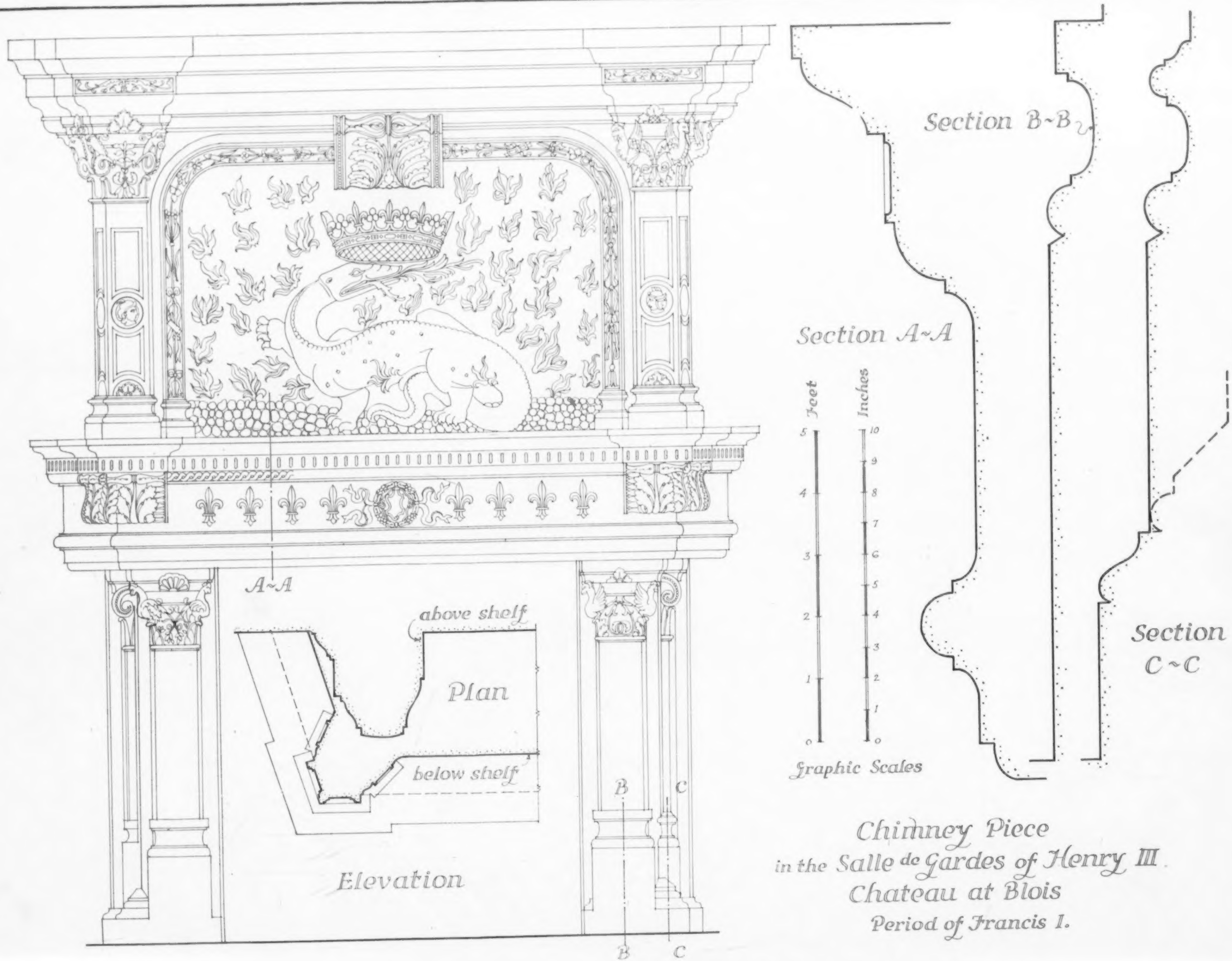


Small Doorway in the Salle de Gardes
Chateau at Blois
Period of Francis I.

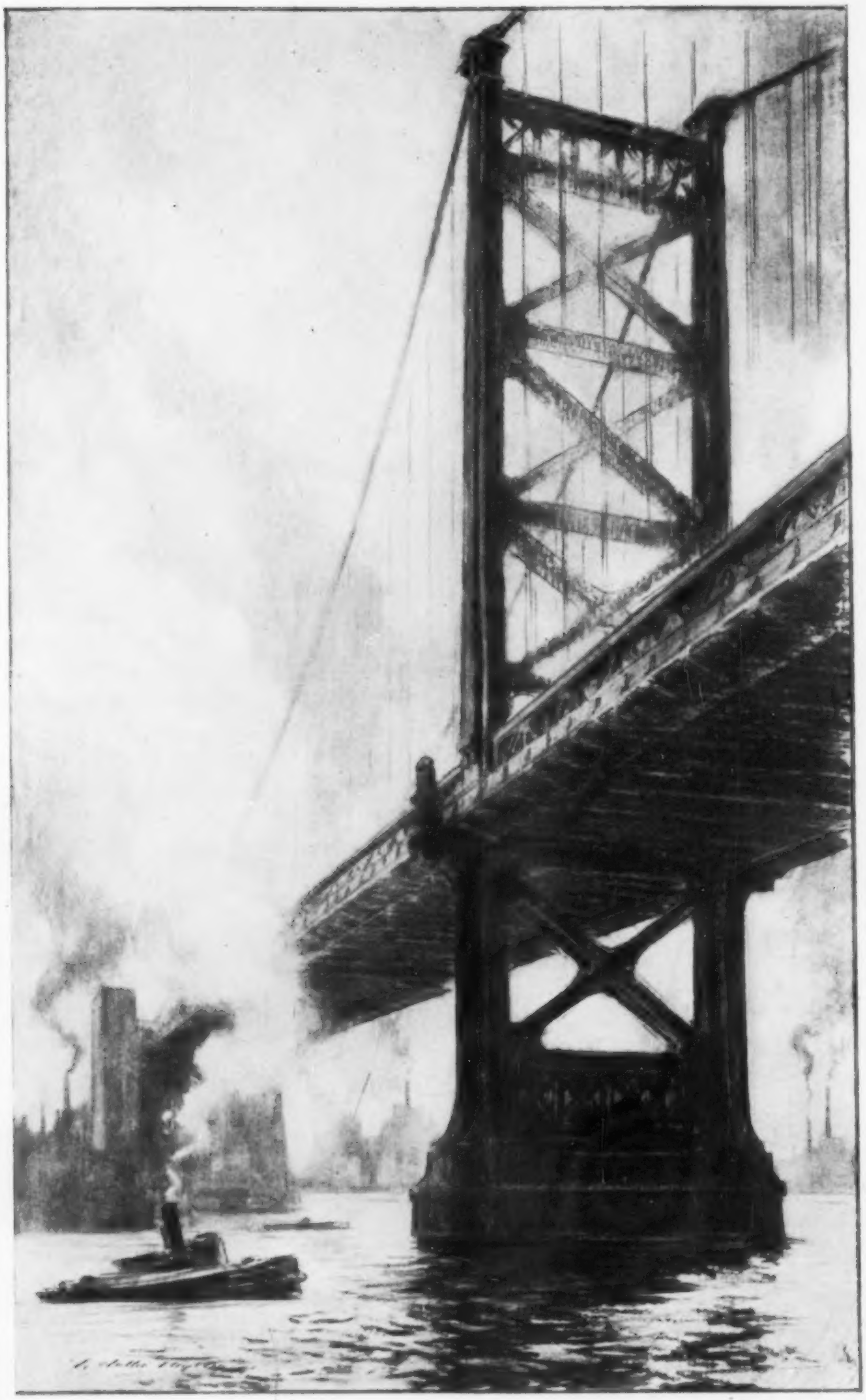


Note ! This is the only place where the Salamander of Francis I occures in this position ....
C
B
B
Round
A
A
Plan
Elevation
Section A~A
Section B~B
Section C~C
Scale in Inches
0
1
2
3
4
5
6
for Profiles
Doorway in the Salle de Gardes of Catherine de Medicis at the Chateau at Blois
Period of Francis I
0
1
2
3
4
Scale in Feet


Painted Ornament
Carving
Plan
Emblem of Ann of Britainy
A
A
Painted Ornament
'C'
Plan
Elevation
Line of Mantle above at 'C'
Section A~A
Corbel
'C'
Chimney Piece in North Wall. Chateau at Blois
Period of Francis I.
The Duc de Guise was warming himself at this chimney when called to his death ....
Graphic Scales
5 4 3 2 1 0 Feet
5 4 3 2 1 0 Inches



Chimney Piece
in the Salle de Gardes of Henry III
Chateau at Blois
Period of Francis I.



THE DELAWARE RIVER BRIDGE

PAUL PHILIPPE CRET, ARCHITECT

From a Preliminary Sketch by F. Walter Taylor

THE
ARCHITECTURAL
FORUM

VOLUME XLIX NUMBER ONE

JULY 1928

THE ARCHITECT AS COLLABORATOR WITH THE ENGINEER

BY
PAUL PHILIPPE CRET

THERE lurks in humanity, whose curious role has always been that of the destined antagonist of nature, a persistent dissatisfaction with nature's inert obedience to its own laws; a dissatisfaction that is active and noble in certain aspects, and in others, foolish and blind,—the source of human power and of human weakness in equal parts. What, for instance, is this paradoxical attitude of mind which combines a clear perception of the laws of progress with a stubborn tendency to look backward, and to see in the past the ideal toward which society ought to be—and is not—proceeding?

Thomas Huxley once observed that Herbert Spencer's idea of a tragedy was a "Theory killed by a Fact." But Spencer was not advancing a mere theory when he defined evolution (that is to say, progress) as the development of the homogeneous into the heterogeneous. He was describing a fact which must, indeed, have been observed long and frequently before his own time for his statement of it to be accepted with such delight as a brand new Truth. In our enlightened day, the high school graduate can glibly inform us that the tendency of all natural organic development is from unity to multiplicity of function, from the homogeneous to the highly differentiated; the full grown man, contemplating our world, and comparing it, by the light of history, with the worlds of other civilizations, sees the law operating in every field of life and action. But it is a law of incessant change, eternally bringing to birth new conditions, eternally forcing him to new adjustments, new ideas, new problems; he is uncomfortable and uncertain, and oppressed at times with an impatient nostalgia for the familiar past. Yet nowhere does he see any example of nature contradicting itself, changing its mind midway, as it were, and remitting the pitiless pressure which forces him on to the future, and to experiences which he cannot foresee.

In this century, when human society finds itself feverishly conscious of its own extraordinary complexity, the idea of a reunion of the separated and highly differentiated parts of its own machinery becomes a dream in which restless and confused imaginations seem to find a fitful repose. A generation whose vast demands upon itself have split the old professions into multitudes of professions, and multiplies them daily with fresh needs for specialization, dreams of its superman who will unite in a supreme genius the knowledge that every day becomes more intricate and more detailed. And the dream becomes all the more cherished as the hope of its realization becomes more futile.

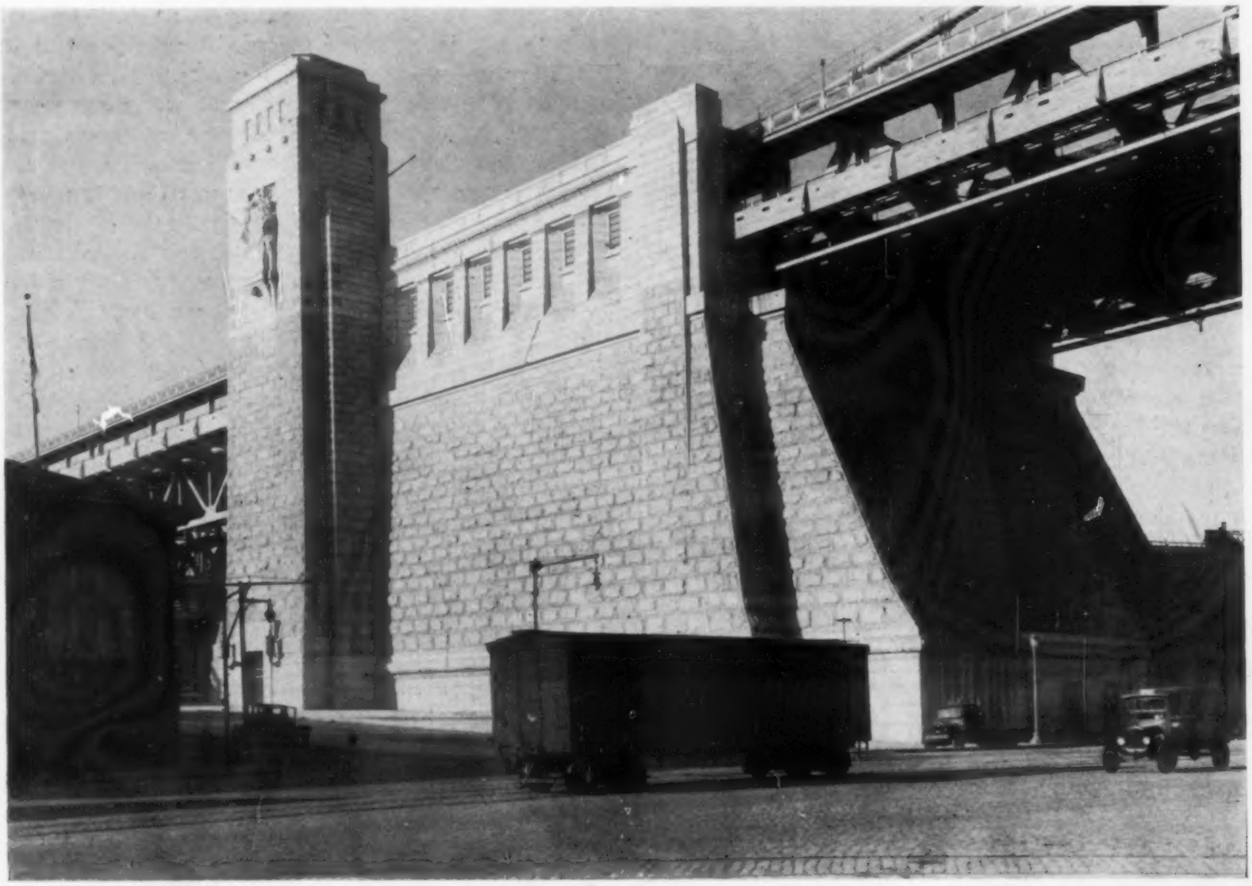
In the year 1747 the institution of the *Ecole des Ponts et Chaussees* in Paris signalized the definite division of the hitherto united professions of engineering and architecture into two distinct professions. Up to that time the engineer, as a specialist in building problems, did not exist. The great bridge builders, for instance, of the seventeenth and eighteenth centuries,—Ducerceau, the Mansarts, Gabriel, Gauthey, Pitrou, and Peronnet (who was the creator of the modern stone bridge),—were architects primarily, trained in architecture, which included what we would now call engineering as one of its branches. That they were masters in both fields is amply proved; the Chapel at Versailles, the *Ecole Militaire*, the Place de la Concorde testify to their ability as architects; the *Pont Neuf*, the *Pont Royal*, the bridge at Blois, and the bridges of Peronnet, which have served as models throughout Europe, to their skill as engineers. Occasionally they had their failures,—as is illustrated by a story at the expense of Jules Hardouin Mansart, which has furnished consolation and a certain ignoble pleasure to several generations of rising architects; the same Mansart, incidentally, whose collaboration with Frere François recalls the tradition of the *"freres pontifs,"*—the brotherhood of bridge builders of the middle ages. Mansart had built a bridge across the Loire. Some time later, when he was at the court of Louis XIV, an official from the district appeared at court for an interview with the king. At the end of the audience, Mansart, whose childish vanity or love of praise was a well known weakness, strutted up to the official and inquired:

"And how goes the bridge?" "Well," replied the other drily, "at the rate at which it was going when

The Delaware River Bridge from the Shore

I left, it is probably at Nantes by this time." Nevertheless, however we may relish a story that restores such men to the human scale, it is to these consummate masters of an ambidextrous profession that we look backward. Their bridges of stone, sturdy and beautiful, will outlast our bridges of steel, and their stately and ample building is not easily surpassed.

At the same time, it must be remembered that their problems were not our problems; nor could they have foreseen, even dimly, the conditions that have developed since their time. Within the last 60 or 75 years the development of steel as a factor of construction has given rise to the necessity for mathematical calculation so complicated and so highly specialized as to have become an individual profession in itself; and every branch of engineering has grown and been subdivided in turn, so that today it is not simply "the engineer" but the mechanical engineer, and the electrical engineer, and the structural engineer, etc., each a specialist in a profession as distinct from other professions of the same family as architecture is from engineering. For a single man to attempt to make himself master of the entire field of modern mechanical mathematics would be little short of lunacy. How, then, can the architect, faced every day with the growing complexity of his own work, hope to unite the necessary proficiency in mechanics with the necessary proficiency in his own province? The increasing diversity of taste in plan-



Photos. John Wallace Gillies, Inc.

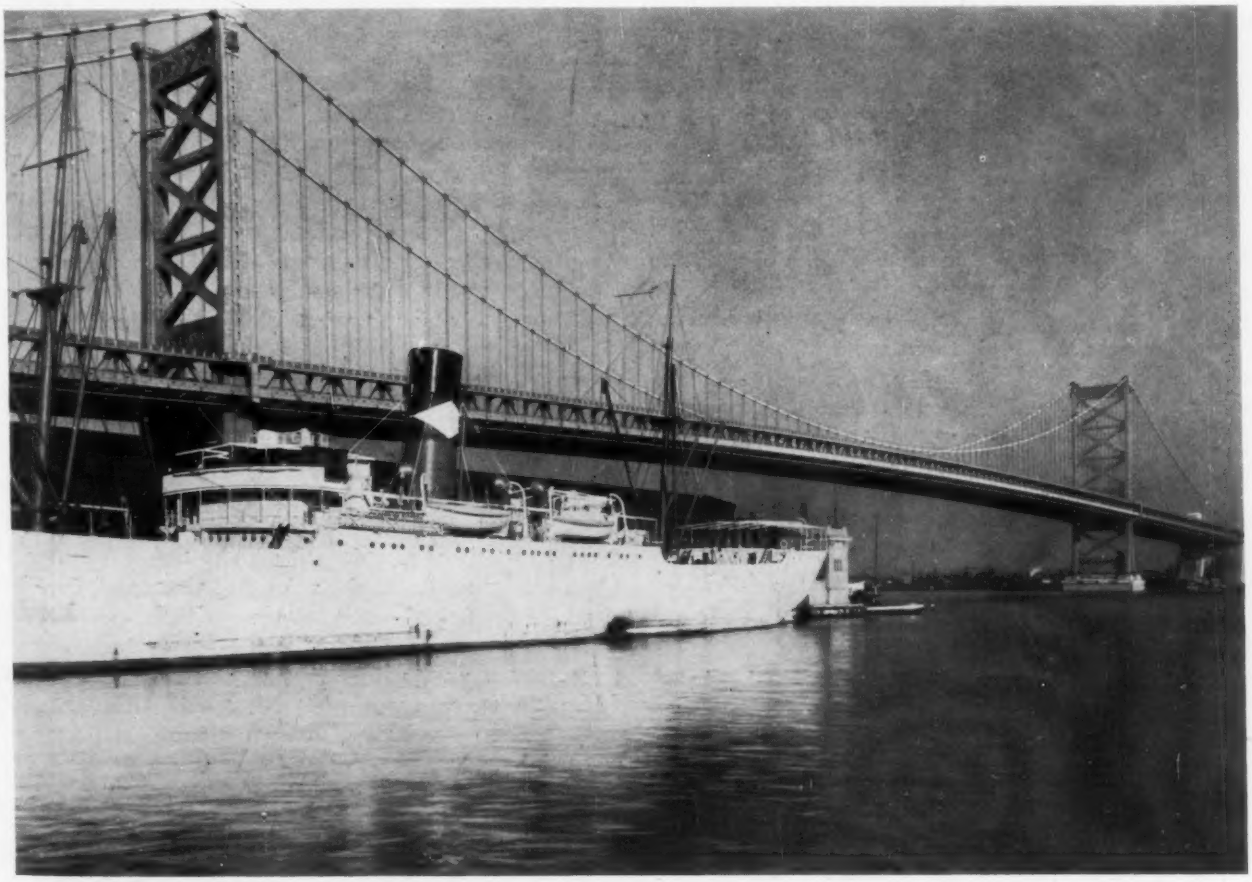
Anchorage and Pylon, Delaware River Bridge
Paul Philippe Cret, Architect

ning and in the use of materials and the necessity of directing a large staff of minor artisans and tradesmen force him to forget even such mathematics as he has learned in order to devote himself exclusively to the problem of æsthetics.

No, it is futile to look backward. Not only has the unity of the old profession been severed, but with each day the hope of reuniting the separate departments of architecture and engineering becomes more vain. Nevertheless, the two professions remain complementary to each other,—individual, impenetrable each to each, yet indissolubly connected, for good or ill. Such is the situation that has given rise to a complaint that is widely made today.

It is argued that this "division of labor" and intense specialization in two professions that are basically interdependent, must entail a serious disadvantage: namely, an inevitable absence of unity,—the unity which is the *sine qua non* of æsthetic value,—in a construction which cannot be conceived as a whole, and worked out in every organic detail in the mind of a single creator. However convincing the argument may sound, the remedy of the evil is not likely to be found in the reappearance on a super-scale of the architect-engineer; but, on the other hand, the evil itself may not be as real as it seems. It is even possible that so far from being a menace to an æsthetic ideal, this division, which has given rise to a powerful new influence in modern

Preliminary Sketch of Anchorage, by F. Walter Taylor



General View of the Bridge from the Water Front
Paul Philippe Cret, Architect

The Base of a Pier

View from the Footwalk

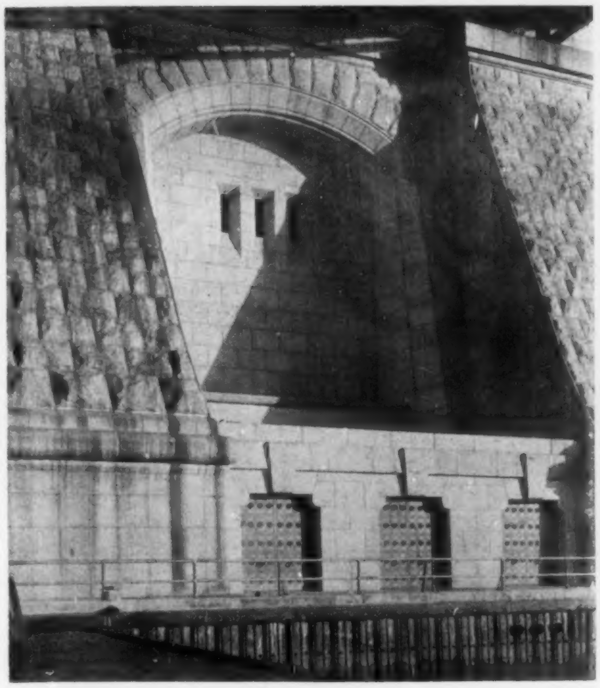
construction, may be the source of a renewed beauty, of an architecture more chaste and vigorous than we have known for many years.

In the full tide of the Victorian age,—that bewildering era when beauty, unhappily confounded with an idea of genteel falsehood, was believed to lie in the successful dissimulation of truth, when "polite" language was a tangle of ladylike euphemisms, and homely objects of utility were monstrously disguised to resemble anything under the sun but what they really were,—Taine remarked that strength and dignity of design were attained not by dissembling but by emphasizing structural purpose. The observation was less a forecast of a new ideal of beauty than a redefinition of a vital element of beauty, which has always been present in fine examples of architectural design. In recognizing the possibilities of beauty latent in the sheer mechanical frame of a construction, we have discovered nothing new. The "new" influence that has come from modern mechanics, from the creation around us of forms evolved by the effort to realize absolute utility and absolute economy, has simply aroused us to a fresh realization that "the laws of number are the laws of order and reason," and that beauty is as much the child of cold reason as of imagination. The Greeks knew this, and the Egyptians before the Greeks; the great architects of later times were those who had not forgotten it.

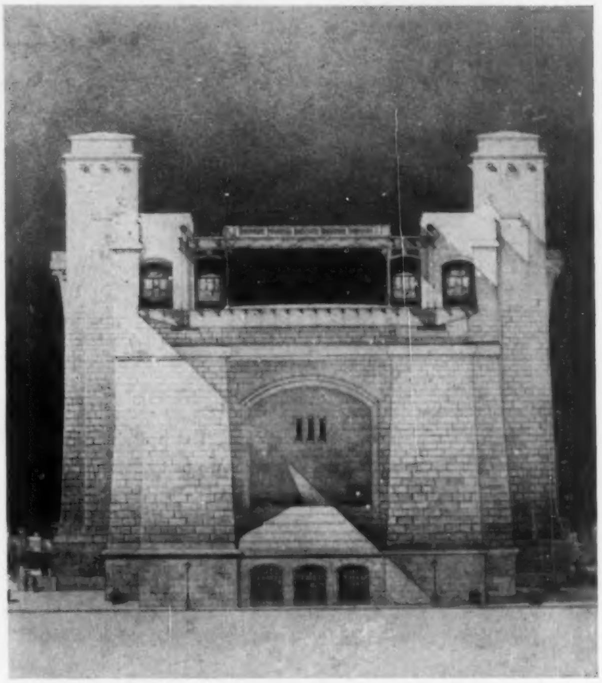
Le Corbusier says: "The Engineer, inspired by the law of economy, and guided by mathematical calculation, brings us into harmony with the laws of the Universe."

But in the enthusiasm which many of us feel for the austere and logical forms which are developed by mechanical mathematics, and in the reaction against the mawkish, the illogical, the senselessly elaborated and meaningless architecture that has been developed out of a feeble sentiment for the "quaint," and a timid respect for popular taste, we must guard against a tendency to make a fetish of the rigid forms that are produced by pure mechanics. *"Dum vitant stulti vitia, in contraria currunt,"*—foolish people, while they are avoiding one vice, rush upon its opposite.

In the cold, simple, and intensely practical forms that have been created to meet the clear-cut demands of utility, there are logic and clarity; in them we see the vigorous starkness of purpose fulfilled, to the exclusion of every other objective. But though we look upon them with a sense of intellectual satisfaction, it is without emotion. We recognize in the concrete expression of mechanical law, the presence of the self-same laws that control and direct universal forces. But though the imagination is stirred, it is not satisfied. Logic and clarity and strength, although they are elements of the beautiful, are not all there is to beauty. Until they are emphasized by subtle modifications of lines and structural proportions,—until a sense of harmony, of rhythm and accent fuses them into an æsthetic unit, they remain mute; they are seen, but they are not felt. To quote again what M. Louis Dimier has said: "The necessities of construction, even supplemented by what M. de Baudot calls economic and social necessities, will never suffice to build an edifice. For of course these ideas have only a limiting and corrective value; they are not creative and fruitful. What is fruitful is the conception of form; it is design which emanates neither from geometry



Base of the Anchorage



Section Drawing of the Bridge

nor from mechanics, but from the imitative arts."

In brief, the architect is not relieved of his task. Architecture remains an art, serving an intense and ineradicable human craving, which art alone can satisfy. Moreover, an architecture which is deduced solely from the necessities of construction is not architecture, because it is not art,—it fails completely to evoke the emotional values latent in a mere manifold of mechanical factors. "Architecture begins where the calculations end."

Thus we return to the æsthetic problem. The architect and the engineer must perform a sort of *duo,* each contributing his share of special knowledge in the creation of a structure which is to be both a mechanical unit and an æsthetic unit. To the engineer, the proof of the value of his work lies solely in its durability and precise fitness for a utilitarian purpose. Æsthetics are "not in his line." Yet it is he who gives the skeleton of the construction. Obviously, therefore, the architect is limited by mechanical conditions imposed upon him from the beginning. Nevertheless, he must control these limitations, and with them, rather than in spite of them, express an organic harmony of design between the mechanical and architectural factors of the structure. "The architect, by establishing a relationship of forms, realizes a pervading order which is the pure creation of his mind; by these forms, he affects our senses intensely, arousing the perception of plasticity; by the relationships which he creates, he awakens in us profound resonances, he gives us a sense of order which one feels to be in accord with the order of the universe, and which we perceive as beauty."

The entire mechanical unit must be intensely realized by the architect before he can endow it with character and significance,—animate it so that it speaks to the imagination and stirs the emotions. Then he may begin his labors, mindful of the truth that Taine has noted,—that strength and dignity of design are attained not by dissembling, but by emphasizing structural purpose. Furthermore, the mechanical restrictions themselves are not wholly inflexible, and the mechanical solution is not necessarily arrived at independently of all æsthetic consideration. The mathematician, working to reconcile a number of mechanical conditions, may find not one, but several solutions,—all equally adequate to meeting the requirements. Obviously there arises a question of choice which may be guided not by mechanical, but by æsthetic considerations. Again, details, such as the shape and thickness of certain beams, or the proportions between certain parts of the steel structure which have no bearing on the mechanical adequacy, can be determined according to their relation to the architectural problem. Details,—yes; because a fundamental change is not necessary to render a form *significant;* but the knowledge that must be drawn on, to effect these minor changes, so vital to the beauty of the whole, is gathered only after long training in æsthetics.

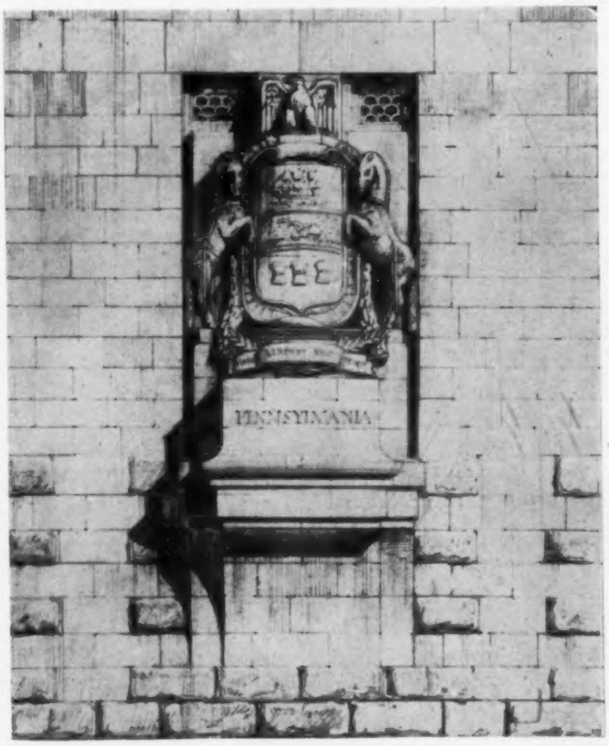
Thus, the architect, collaborating with the engineer, finds that even in the construction of the framework itself, he can exert an influence toward the architecural design that he is to develop. On the other hand, for him to ignore the influence of the mechanical design would be a fatal step in the direction of defeating the whole æsthetic purpose. He cannot allow himself to forget, for instance, that the "spirit" of a steel form is not the "spirit" of

Flag Pole Base and Lamps

Lighting Standard at Philadelphia Plaza

stone. In the middle of the last century Labrouste was among the first to realize the truth of this important canon of modern architecture, and to experiment in designs peculiarly adapted to the strength and simplicity of the steel frame. The "beauty of iron" is not the "beauty of marble" or granite. The cartouches and architectural mouldings of the stone vocabulary lose all meaning as the ornamentation of a metal form. The piers of a steel bridge are—the piers of a steel bridge; to conceive them as a "portal," and so to develop them architecturally as a Roman city gate, or triumphal arch, would be a fatal contradiction of their function. Always, the clear and at the same time imaginative interpreta-

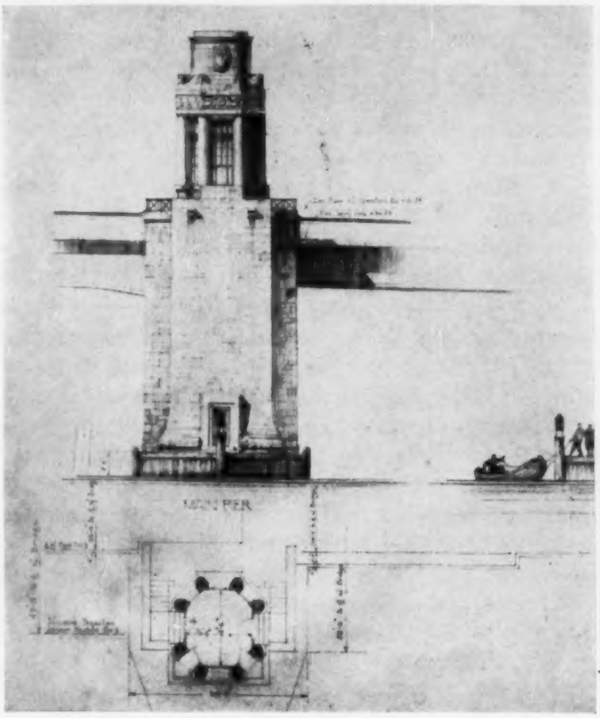
Anchorage Pylon from a Side Street



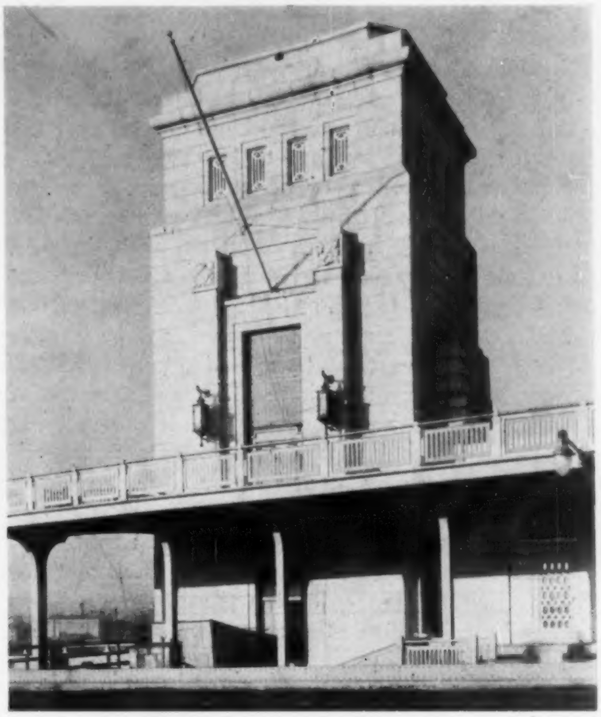
Sketch of a Coat of Arms for Pylon

Delaware River Bridge, Details

Paul Philippe Cret, Architect

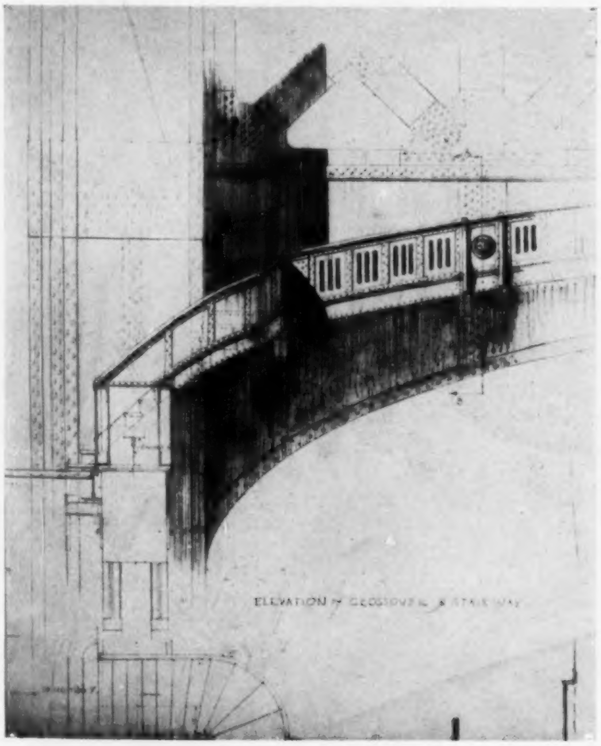


Main Pier, University Avenue Bridge
Paul Philippe Cret, Architect

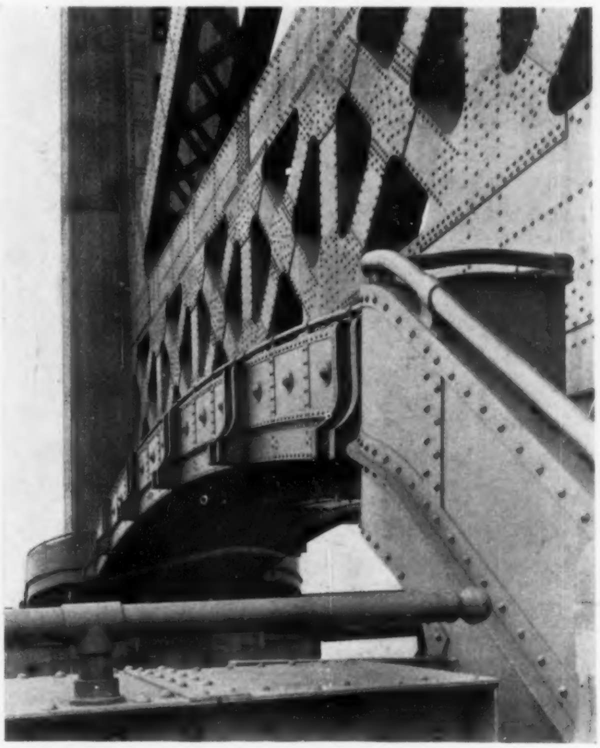


Pylon Tower, Delaware River Bridge
Paul Philippe Cret, Architect

tion of structural function must be sought, as where the angle of opposing lines can accent the sense of powerful resistance to strain, or where the massing and modeling of stone or concrete can convey an intensified feeling of solid and immovable repose. The architect must have no fear of simplicity; he must have the daring to sacrifice the facile commonplaces of stereotyped trimming; he must be ready to forget even the beautiful forms that stock his mental arsenal; he must have the courage to eliminate—and eliminate; a glance at any engraving of the Parthenon may convince him of the value of such sacrifices. His task is not to decorate, but to interpret—to clothe, if you will, but to clothe in a



Preliminary Sketch of the Cross Over



The Cross Over Above the Roadway

Delaware River Bridge, Details
Paul Philippe Cret, Architect

vesture that reveals rather than in a garment that conceals.

In the end, the problem reduces itself to the necessity for a sensitive perception of the character and spirit of metal construction. Up to a point we may cling to the rules; but beauty is an outlaw, eluding the grasp of intellect or of industry, and yielding only to an incommunicable instinct in man which is as lawless as itself. The dogmatist who seeks too conscientiously to obey the canons of an æsthetic theory will fall as far short of achieving a beautiful thing as the indifferent and slipshod workman. There is no justice in art, and the artist knows no conscience but his own instinct. But it is this instinct which, violating law in a spirit of holiness, brings into being the new forms, which, strange and disturbing as they may be at first, in time are seen to be eloquent expressions of a true perception.

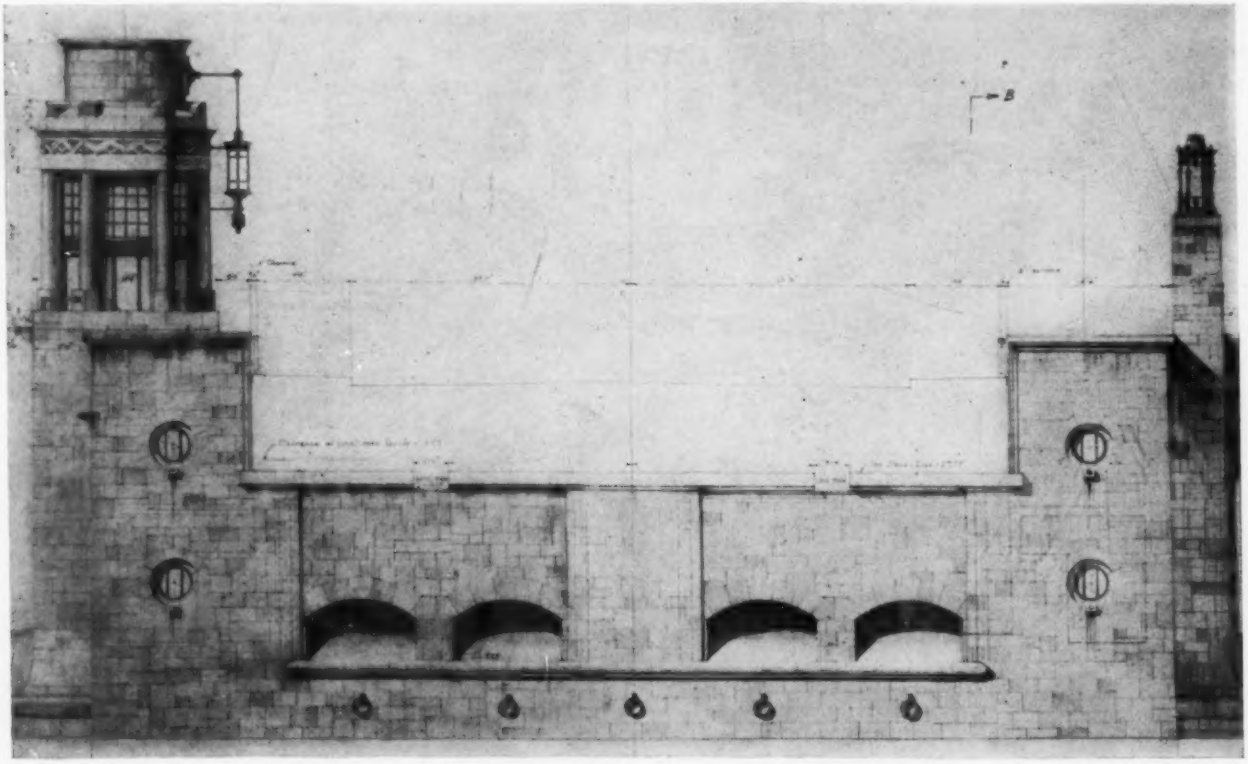
And, finally, it should be remembered that to the creative mind, every change and displacement that time and circumstance develop are elements that enrich rather than limit the means of creation. The creative instinct remains a constant force, strong enough to encounter even the problems that it views with alarm, and insistent enough to master them.

The illustrations accompanying this article are from photographs and drawings of the Delaware River Bridge between Philadelphia and Camden, and of the University Avenue Bridge in Philadelphia. They were selected to illustrate an attempt to harmonize the stonework with the steel construction, and to give architectural value to the steel forms without having recourse to useless members or ornament. It was thought by both the engineers and the architect that, in most cases, ornamentation does not readily become an integral part of the design, but remains, as it were, "tacked on," detracting from the austere beauty of the steel members.

The architect wishes here to acknowledge that his collaboration with the engineers of the Delaware River Bridge, Messrs. Ralph Modjeski, Chairman of the Board; George H. Webster; and Lawrence A. Ball; and with the engineers of the University Avenue Bridge, Messrs. Vogelson, Chief of the Bureau of Engineering; and Noyes, Engineer of Bridges; has been of great assistance to him in restraining the tendency of the architectural "Old Adam" to relapse into too much architecture; and also that his constant intercourse with men of the highest professional merit was a most pleasant experience to him. He realizes that his contribution to the common undertaking is of small value compared with theirs, and claims only the merit of having tried earnestly to understand their points of view in this worthy achievement.

Statistical Data:

Total length of bridge and approaches	9,570	feet
Length of bridge proper	3,535	"
Length of main span	1,750	"
Width of bridge	128	"
Clearance above high water	135	"
Height of towers	380	"
Cost	$36,000.000	



Drawn by J. H. Hough

Sketch of Main Piers, University Avenue Bridge, Philadelphia

Paul Philippe Cret, Architect

ILLUMINATION IN THE PHILADELPHIA MUSEUM OF ART

BY

C. E. WEITZ

ELECTRICAL ENGINEER

ALL of the treasures handed down to us from the past appeal to just one of our senses,—sight. The prime essential in museums, therefore, is that the objects of art may be well seen; this, of course, means that they must be well lighted. As we contemplate art or architecture, we find that each historic period wrote its own chapter, and our present viewpoint is a composite of lessons from the past. In the matter of lighting, however, though the subject is as old as the human race, very little can be safely taken from the past. Modern illumination is a new art, born of the science of the present generation. Its progress is measured in years, not in centuries.

Natural Daylight versus Artificial Daylight. While it is possible to design a building with primarily daylight illumination, it may mean a considerable compromise architecturally. Efforts in this direction have resulted in a distinct type of modern factory building with glass walls, but such a departure would hardly be considered for any building of the monumental type. Furthermore, the lighting requirements of an art museum are such that natural daylight illumination is limited to some extent to that obtained from skylights. With skylight construction, elaborate louver systems are essential to control the direct sunlight and also to overcome the natural tendency toward a maximum illumination on the floor rather than on the walls. Such skylight and louver installations are not only expensive initially but they inevitably impose severe restrictions on the design of the artificial lighting system. The large areas of skylight make the room hot in summer and give rise to expensive heat losses in winter. Questions of leakage, and of the cracking of glass, due to constant expansion and contraction, necessitate an efficient system of maintenance. Again, the latest researches have shown that the fading and discoloration of the pigments in paintings can be minimized, if not eliminated altogether, by the use of artificial light. It was logical, then, that those who have given the art museum problem the most thought should have reached the conclusion that provision of artificial lighting, with its constant quality and 24-hour availability, should be the first and foremost element as far as illumination is concerned.

Daylight Illusion. An illusion of natural daylight in the Philadelphia Museum is obtained through the use of "daylight" incandescent lamps, exclusively. These lamps, with their blue glass bulbs, correct the light of ordinary bulbs to a color not coldly white but of a hue which approximates that of natural light indoors which has been mellowed somewhat by window draperies and the tone of the interior decorations of the room. Nearly one thousand lamps are used to light the portion of the museum now completed. The lamps range in size from 60 to 1000 watts, each definitely and designedly contributing its part to the lighting ensemble. Some are used in floodlight projectors above artificial skylights, others in coves concealed in ceiling ledges, while

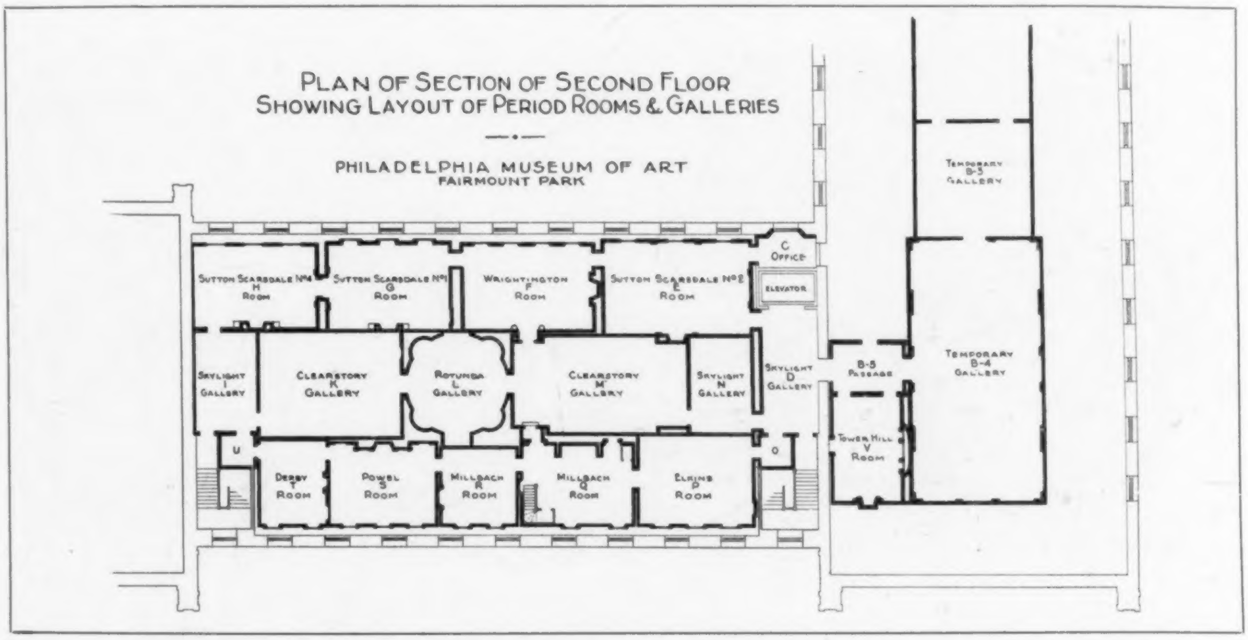


Fig. 1. Plan Showing Fenestration Unrelated to Interior

Fig. 2. Artificial Lighting of Large Gallery

Fig. 3. Mounting of Projectors for Lighting at Left

others are parts of artificial windows,—but not one lamp is exposed to view.

The function of light is to reveal, and as such it should seem to pervade the whole. It should quietly play its part rather than intrude itself upon us. It was with this conception that the lighting problem of the various galleries of the new Philadelphia Museum was undertaken. No matter what words are used to describe the lighting effects, the lighting was planned not to introduce any mystic or esoteric effects, but purely as an unconscious illusion of normal daylight as an unobtrusive part of the whole. Let it be said further, however, that the technique employed is new and unusual, simply because usual methods have often left much to be desired in contributing the subtle but all-important part light should play. The most conspicuous feature of the lighting is the absence of those faults which most of us have been led by long experience to feel are necessary evils of a paintings display,—too strong a light, too weak a light, or dazzling light thrown back from the surfaces of the paintings by reflections of the light sources themselves. How refreshing to find these customary faults non-existent in the Philadelphia Museum! One writer described the lighting as one "of soft, steady daylight everywhere. While the sky was a sooty gray outside, with no hint of the sun, within the rooms a clear, diffused illumination gave the illusion of a June day, with the sun behind light,

Illumination of Large Gallery Wall. Ceiling Reflections Absent

friendly clouds,—and done in such a fashion as to reveal the witcheries of carved panels and painted canvases which transported visitors to the far-off days of the Georges." And that is the effect which those planning the lighting strove to secure. They sought to have the lighting as natural as possible in the many galleries as well as in the period rooms, and it was obtained by unusual arrangements of lighting devices. To supplement some settings, additional light was so directed as to render the most advantageous viewing of the displays.

Five Systems Employed. The portion of the Museum opened to the public for the first time in the latter part of March, consists of a section along the north and east sides of the third or main floor. The main hall at present consists of a series of four temporary galleries, occupying a space approximately 30 by 180 feet; the northeast wing comprises three main sections,—a central series of large and small galleries flanked on either side by a series of period rooms. The arrangement of the various galleries is shown in Fig. 1. The lighting for the galleries has been designed specifically as a part of the architectural treatment, which divides into five general types.

Lighting the Temporary Galleries. The large temporary galleries along the north side are partially ceiled with glass, through which comes a glow of light, soft and diffused. A typical gallery is shown in Fig. 2. Each skylight section is boxed in by a large housing, painted white inside to reflect the light from a number of daylight lamps within. These lamps are mounted well above the glass to give an even distribution of light and to avoid casting apparent bright spots on the skylight. But little dependence, however, is placed on the skylights for the strong, steady light that is essential for the gallery walls. Consequently only enough light comes through the skylight to make the glass softly luminous. Bounding the glass ceiling area on all four sides are

Fig. 4. Small Galleries Are Lighted by Artificial Skylights

beams dropped a foot below the ceiling and extending both lengthwise and crosswise of the room about 5 feet from the walls. In general appearance these beams are no more than supporting members of the ceiling structure, but their primary purpose is to form the housing for the source of the gallery wall illumination. The sides of these drop beams toward the walls are of stippled glass sections behind which are concealed projectors so adjusted as to direct a flood of white light on the picture areas. These projectors, each using a 200-watt daylight lamp, are spaced 2 to 3 feet apart along the beams and are mounted on swivel joints for aiming as desired (Fig. 3). Each plays its own part in the lighting of a definite portion of the wall area of the galleries.

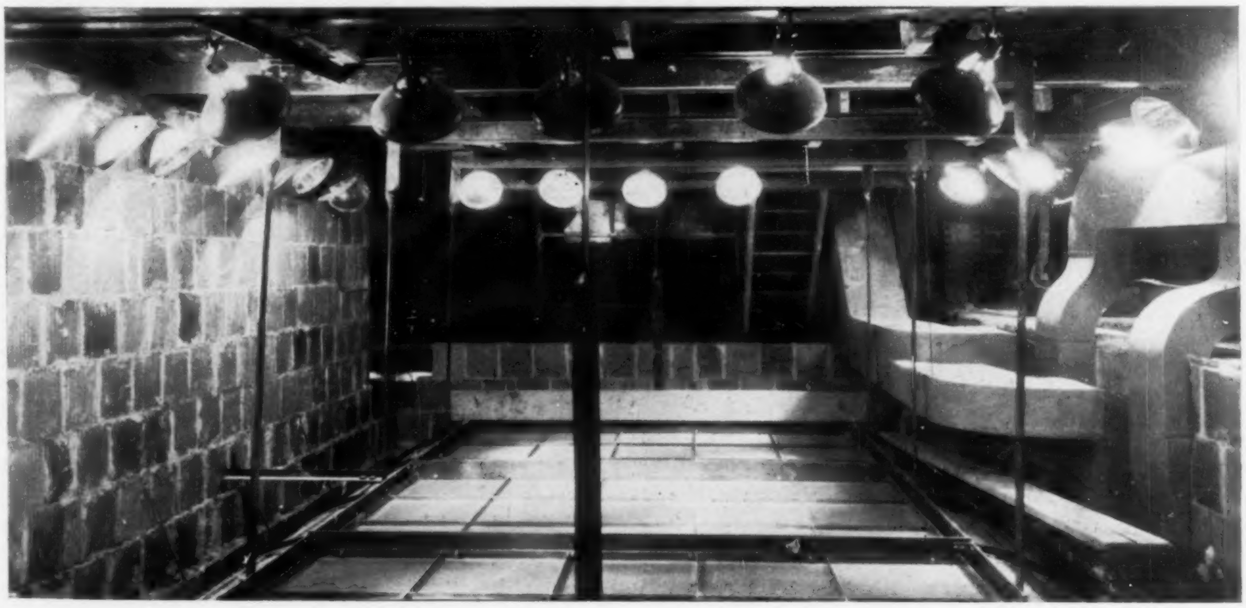


Fig. 5. Projectors Above Skylight Over Small Gallery

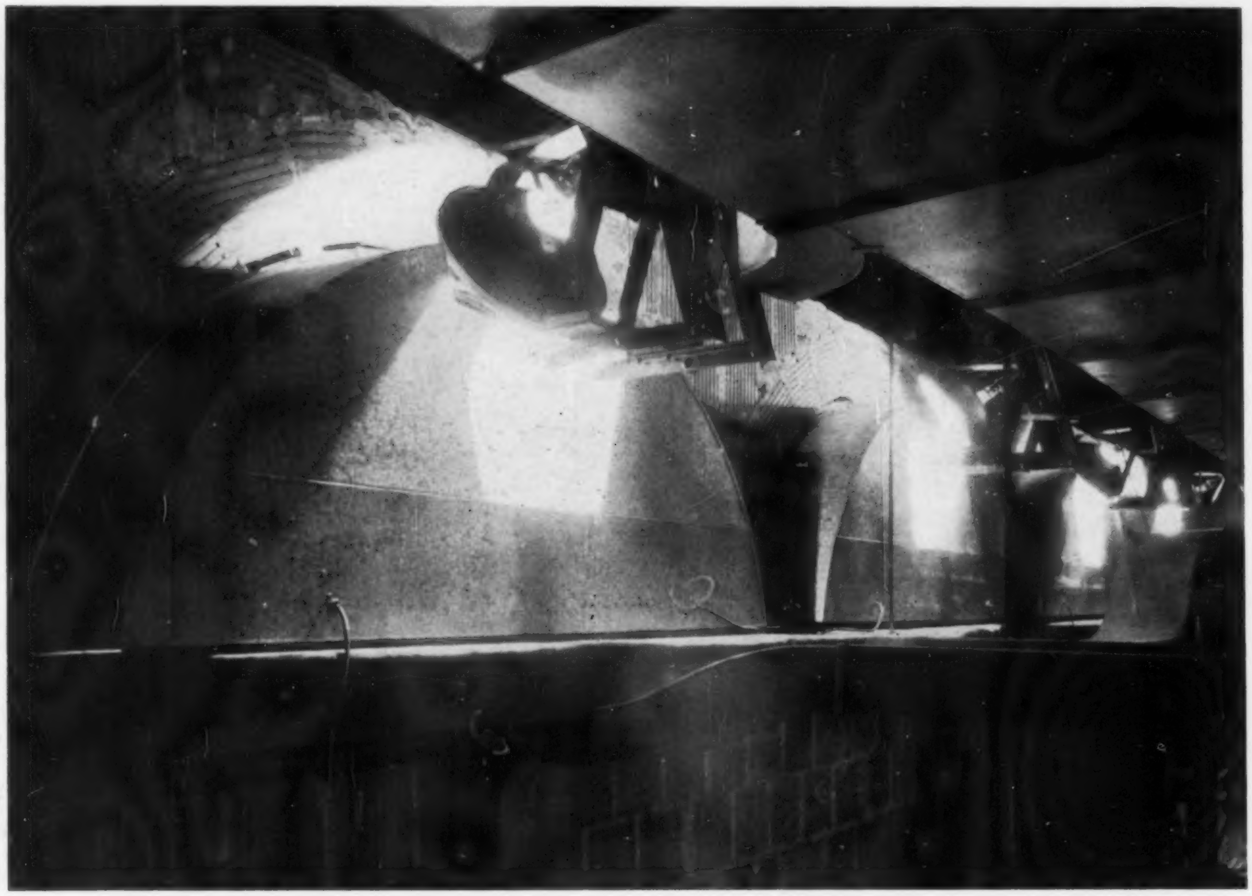


Fig. 6. Location of Projectors Behind the Clerestory Lunettes

Three Small Galleries Have Artificial Skylights. In the wing adjoining the large temporary galleries there are three small galleries,—D, N, and I, shown in Fig. 1. They are paneled in velvet of royal scarlet, warm golden brown, and glossy gray. These galleries have skylight construction, but being of smaller sizes do not permit or require the exact lighting treatment just described. Instead, the skylight is the only source of light, but unusual emphasis is given the paintings on the walls by a battery of 28 floodlights above each skylight on all four sides. Each floodlight has a concentrated distribution of light, and is directed at the desired angle toward the walls rather than toward the floor, so that the paintings are adequately lighted and the wall coverings glow with natural velvety luster. A typical gallery of this construction is shown in Fig. 4, while a view of the equipment installed is shown in Fig. 5.

Cove Lighting for Rotunda Dome. The rotunda, which forms the central portion of the northeast wing, is lighted from a concealed cove at the base of the vaulted dome,—daylight lamps, of course. But aside from an effect that is striking, the application is not at all uncommon. This lighting does, however, emphasize the delicate colorings and patterns in the ceiling, while the dome is crowned by a luminous panel behind which can be placed spotlights to highlight statuary in the niches which face a life-sized bronze of Washington standing at the center of the rotunda floor (Fig. 10).

Thousand-Watt Projectors Light Clerestory Galleries. The clerestory galleries, as the name implies, have high arched ceilings as in the nave of a church, with semi-circular windows high up along each side. These galleries join the rotunda on either side. The larger of the two is 26 by 28 feet, and has three windows on each side. Each window is divided into seven radial sections fitted with ribbed glass. Behind the center panel of each window, on both sides of the room, are 1000-watt projectors which direct a cross-spread of light upon the picture area of the opposite wall. The other six panels of each window are backed up with a sheet metal housing within which are several 200-watt daylight lamps to make the entire window luminous. Fig. 6 shows where the projectors are located. A view of one of these galleries is shown in Fig. 7. The effect is that of natural daylight streaming in through the clerestory.

Unusual Lighting Methods in Period Rooms. Perhaps the most unusual treatment is manifest in the period rooms,—particularly so if we seek to emphasize the departure from architectural precedents so increasingly necessary if the full potentiality of lighting is to be gained. There are four English rooms of the period from 1724 to 1754, taken in their entirety from Sutton-Scarsdale and Wright-

Fig. 7. Clerestory Lunettes in Large Gallery

ington Hall, also a room from Treat House, Upminster, and a Tower Hill room. There are four American rooms, one from the Powel house, Philadelphia, where Washington, Lafayette, and Franklin stopped when they came to Philadelphia. There, too, dashing British officers entertained, while Washington and his men lay at Valley Forge. Another room is from the Derby house, Salem, and there are two Pennsylvania Dutch rooms from the Muller house, Millbach, Pa.

These rooms indicate the scope and excellence which will make the new Museum famous throughout the world of art. They are originals, transplanted with meticulous care to this new and stately building which crowns Philadelphia's acropolis. There are the golden brown fumed oak wainscotings of Sutton-Scarsdale with the tragic, deathless loveliness of Lady Hamilton looking down from one great canvas, surrounded by other Romneys, Gainsboroughs, and Raeburns of the McFadden collection. Since these rooms are set bodily within the walls of the Museum, use of natural daylight alone was impracticable; still, if the rooms were to retain their character and charm, the daylight effect was necessary. Strong shafts of direct sunlight through these windows, while producing a very natural effect, might be bright enough to obliterate details of paintings along certain sides of the rooms. When these rooms were reconstructed within the Museum, a small space was provided between the building's walls and the outside walls of the rooms. This allows some diffusion of natural daylight to filter in through the inner windows, but by dropping white curtains outside the rooms' windows a soft diffused artificial light is reflected into the rooms. Daylight lamps mounted around the outer edges of the window frames direct their light to these curtains, and this is particularly true of the Tower Hill Room, giving a pleasing daylight effect. In this case, as will be noted by reference to the plan shown in Fig. 1, the windows actually look out upon the walls of the temporary gallery which have been curved around and direct into the room the light from concealed lamps.

Though such a scheme creates the illusion of natural lighting, it is not satisfactory as the primary lighting in those rooms. To light, effectively and unobtrusively, the wainscoting and the paintings which grace the walls, a scheme similar in principle to that described for the temporary galleries is used. Instead, however, of beams dropped from the ceiling to conceal supplementary equipment, we find a unique departure from architectural precedent. In order to accommodate floodlight projectors to light the walls predominantly, the architects have, in effect, taken a sharp knife and cut through the ceilings about 4 feet from the walls all around. Then the

Fig. 8. The Sutton-Scarsdale Room

inner edges of this incision are bent down about 6 inches, leaving the central portion of the ceiling in a gracefully curved arch. This allows a band of stippled glass to be inserted,—or a cove, if one will,—into the ceiling, behind which are mounted floodlights which sweep the walls. The drawing in Fig. 9 shows this, while Fig. 8 shows the lighting results as obtained in the Sutton-Scarsdale Room.

The question was asked of Mr. Borie, one of the architects, how, in architects' parlance, this type of ceiling would be designated. He naïvely answered, "Plaster." And, so it seems, the Philadelphia Museum shows architectural departures in reference to illumination results at almost every turn. This pioneering spirit in an architectural way evidences faith in the plans of the lighting of the Museum.

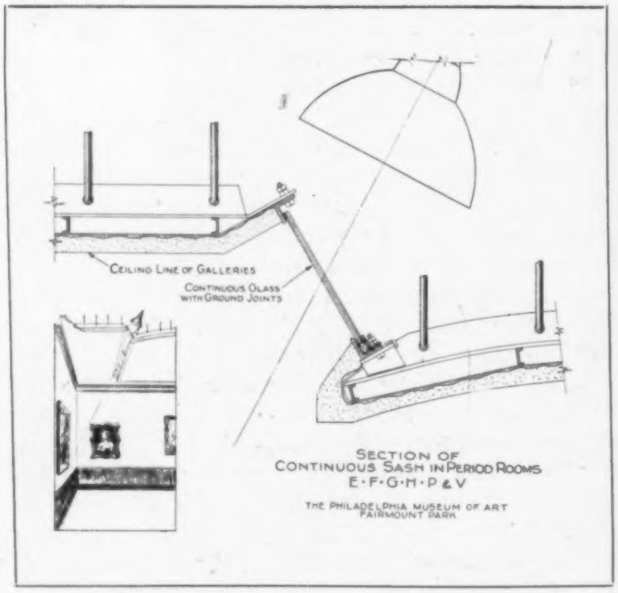


Fig. 9. Diagram of Lighting of Sutton-Scarsdale Room and Other Period Rooms

Fig. 10. Artificial Lighting of the Rotunda Dome Reveals the Coloring and Design

THE STRUCTURAL FRAME OF THE NEW TEMPLE EMANU-EL BUILDING

BY

EUGENE W. STERN

CONSULTING STRUCTURAL ENGINEER

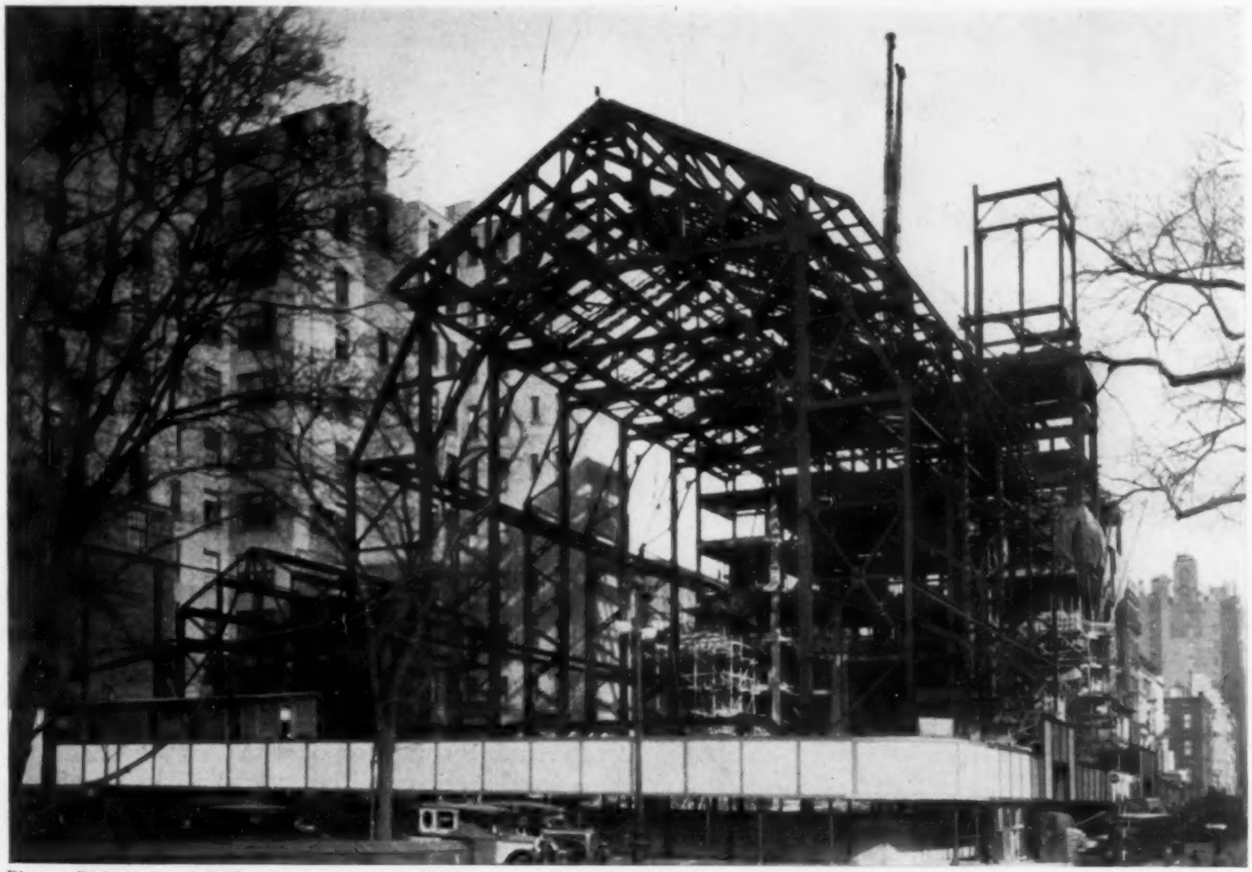
THE structural frame of the new Temple Emanu-El building in New York is principally of steel construction, but portions are of reinforced concrete as well as masonry, the material chosen being that best adapted to suit the particular condition.

General Description. The structure is in reality a group of three buildings,—the Temple proper, the Beth-El Chapel, and the Community House. The Temple proper is a large auditorium, 100 feet by 176 feet, seating in all 2,500 people, of whom over 2,000 are accommodated on the main floor and the remainder principally in the west gallery. All seats are so placed as to provide a view of the ark and the pulpits. Of the total length of the auditorium, about 25 feet are taken up by the sanctuary, which is separated from the main body of the auditorium by an arch about 40 feet in width.

To the north of the Temple is the Beth-El Chapel, about 50 feet by 100 feet, a two-domed structure with a separate entrance from Fifth Avenue. This chapel has been planned to seat about 325 persons, the only gallery being a small choir gallery at the west end.

To the east of Temple Emanu-El is the Community House, which is an eight-story building, 100 feet deep. The main body of the structure is about 50 feet in width and has an entrance vestibule and elevator tower, placed on the 65th Street side between the Temple and the Community House. The tower is about 175 feet high to the top of the stonework. The Community House contains, on the ground floor, a large auditorium; on the second floor, the offices of the Temple and the library; and on the next five floors, classrooms; while the eighth floor includes the rabbis' studies, trustees' room, etc.

Temple Emanu-El. The nave of the Temple is 77 feet wide, 147 feet, 6 inches long, and 103 feet high, from floor to ridge of ceiling. The columns supporting the trusses are built in the form of a trussed frame 8 feet deep, designed to carry 30 pounds per square foot horizontal wind pressure. The roof trusses, spaced 27½ feet apart, have trussed top chords, the tops of which are in the plane of the roof and the bottoms in the plane of the ceiling, as may be seen in these illustrations. The bottom chords of these trusses are horizontal members and are exposed. The web members of the trusses are not visible, being hidden by the ceiling, as they are in the space between the ceiling and the



Photos. Richard Southall Grant

The Frame of Temple Emanu-El from Fifth Avenue

The Main Roof Trusses

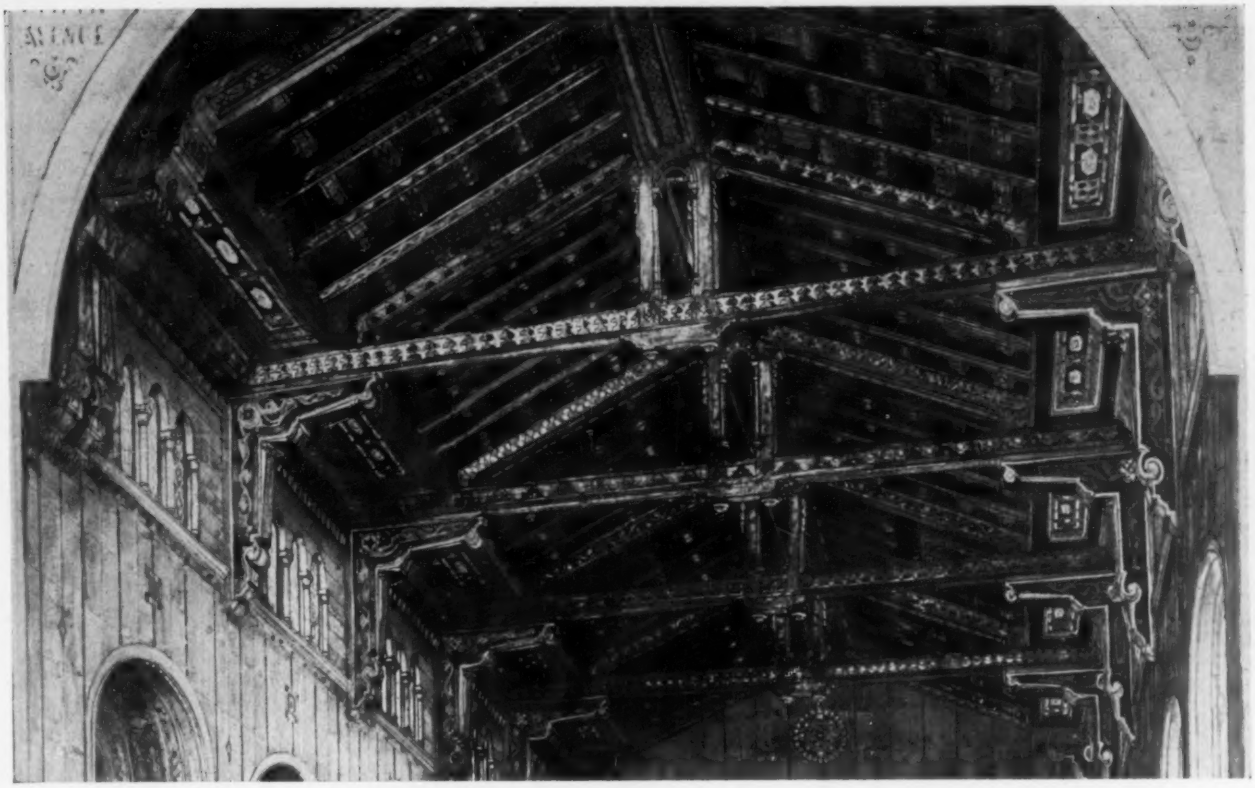
Looking Toward Central Park

roof. This design of truss, having a system of triangular web members which supports both the roof and ceiling, is readily analyzed for stresses, being statically determinate, and was quite the most economical design that would meet the conditions of the problem. The walls are of masonry, reinforced concrete and brick faced with limestone, and are self-supporting, except the clerestory, which is carried on reinforced concrete girders at a level of 61 feet above the first floor. These girders are supported on reinforced concrete columns.

The front of the building on Fifth Avenue has a reinforced concrete frame and arch, 108 feet high, from the street level to the roof, which carries the load of the roof to the foundations. The stone facing supports itself and is anchored to the concrete. In the basement of the Temple there is a banquet room, of 50 feet clear width between the columns which support the main floor. By using a cantilever system of floor beams it was possible to support the first floor on 20-inch beams about 9 feet on centers.

Bracing. Adequate bracing, both vertically and horizontally, has been provided, some of which is temporary and will be removed after the reinforced concrete and masonry work of the enclosing walls are completed. In general, the bracing consists of 1-inch rods with turnbuckles, and struts made of two channels riveted together in the form of a T.

Chapel Beth-El. The structural frame of the Chapel is quite simple, there being nothing unusual in the problem of supporting the roof and the domed



Main Roof Trusses as They Will Appear When Finished

ceiling, which is hung from trusses. The decorative masonry of the interior is practically all self-supporting or carried on reinforced concrete construction.

Community House. This building is eight stories in height and is designed for a future extension of two stories. The first story provides an auditorium with gallery, and it was, of course, necessary to have this space free of exposed columns. To accomplish this all the interior columns which carry the upper floors were supported at the third floor on a system of trusses, whose depth is the full story height of the second story. There are three trusses 14½ feet deep and one plate girder 10 feet deep, which support the framing of all floors above the auditorium. These trusses, therefore, carry heavy loads, and one of them has a span of 47½ feet and supports 1100 tons. In the design of these trusses the details are so arranged that in all field connections the rivets are in double shear, thus reducing the number of field rivets to a minimum, and allowing the use of smaller gusset plates at the connections,—an important matter, inasmuch as door, corridor, and window openings had to be provided for in the design of the web system of these trusses. In Truss T-1 the main top chord compression member is a box section made up of four 15-inch channels, 55 pounds per foot, with 22-inch cover plates 1¼ inches thick. All steel trusses and connections of columns to trusses were assembled in the shop, and all holes for field connections were reamed or drilled through the solid metal. This proved to be very satisfactory in every way and saved materially in the cost of erection, as

Supports and Bracing

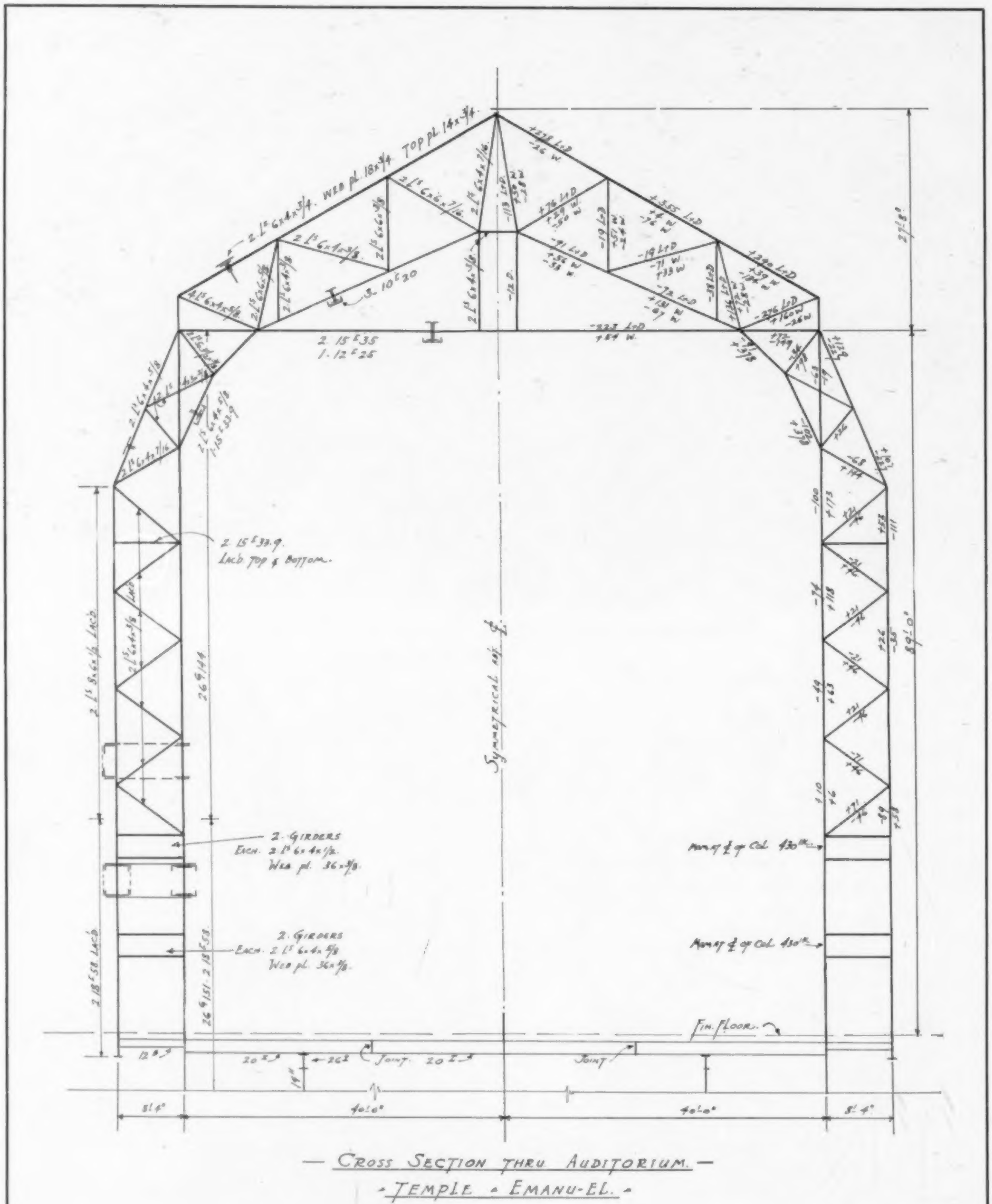
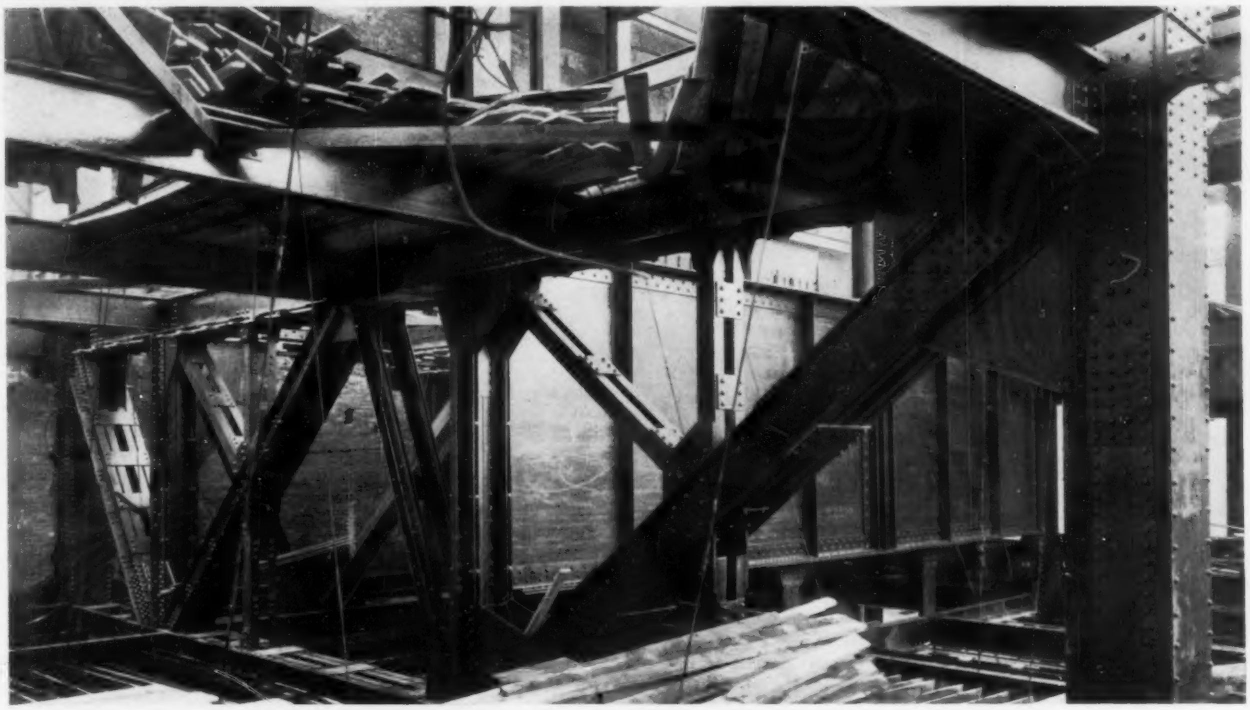


DIAGRAM OF STRUCTURAL FRAME OF THE AUDITORIUM

TEMPLE EMANU-EL, NEW YORK

ROBERT D. KOHN, CHARLES BUTLER AND CLARENCE S. STEIN, ASSOCIATED, ARCHITECTS

EUGENE W. STERN, CONSULTING STRUCTURAL ENGINEER



View of Truss Supporting Community House

the pieces were fitted together in the field without any reaming or drifting.

Floor Construction. Owing to the difficulty of obtaining clean anthracite cinders in New York, it was deemed undesirable to use cinder concrete in the floors. Stone concrete of 1:2:4 mix, and combination tile, one- and two-way systems, and reinforced concrete floors have been used throughout. In the Temple the main floor slab is 4-inch reinforced concrete, supported on steel beams spaced about 9 feet apart, the reinforcing consisting of ⅜-inch round bars spaced about 5 inches on centers placed diagonally in two directions so as to accommodate the openings for ventilating sleeves. The roof consists of a 3½-inch reinforced concrete slab on which there is a 2-inch layer of nailing concrete in which are 2 by 3-inch wood nailing strips spaced about 2 feet apart, to which the covering of copper is attached. In the Chapel Beth-El the floor construction is entirely of reinforced concrete with reinforced concrete girders and hollow tile concrete ribbed floor slabs. The floors of the Community House are similar, consisting of one- and two-way hollow tile and concrete ribbed slab systems on steel girders.

Robert D. Kohn, Charles Butler and Clarence S. Stein, associated, were the architects, and Mayers, Murray & Phillips the consulting architects. The author was the structural engineer. The structural design of the building was planned solely to meet the architectural and structural requirements.

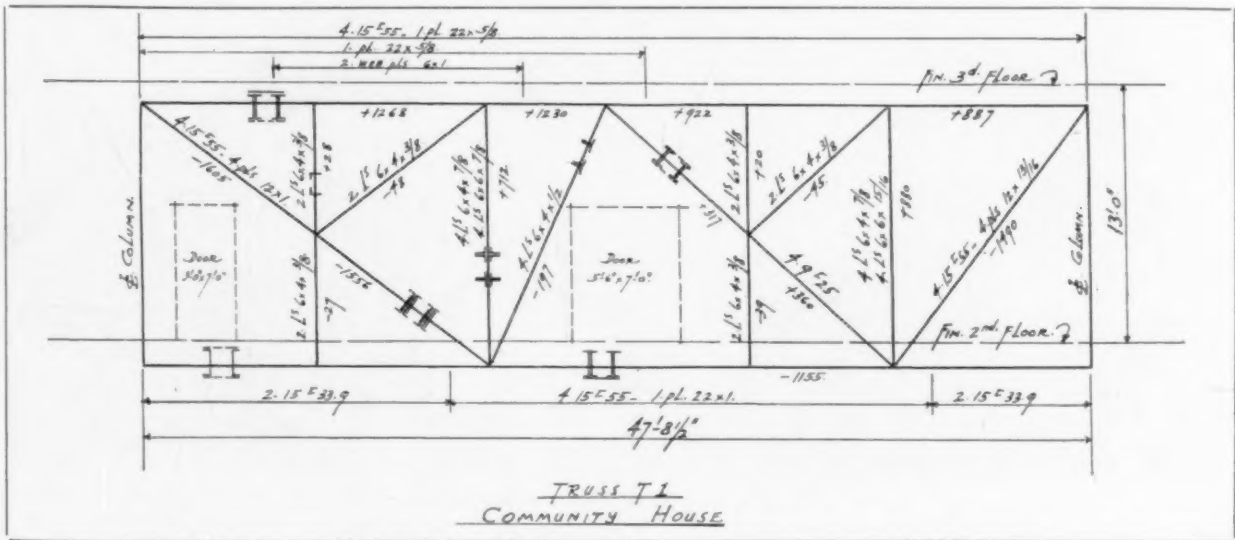
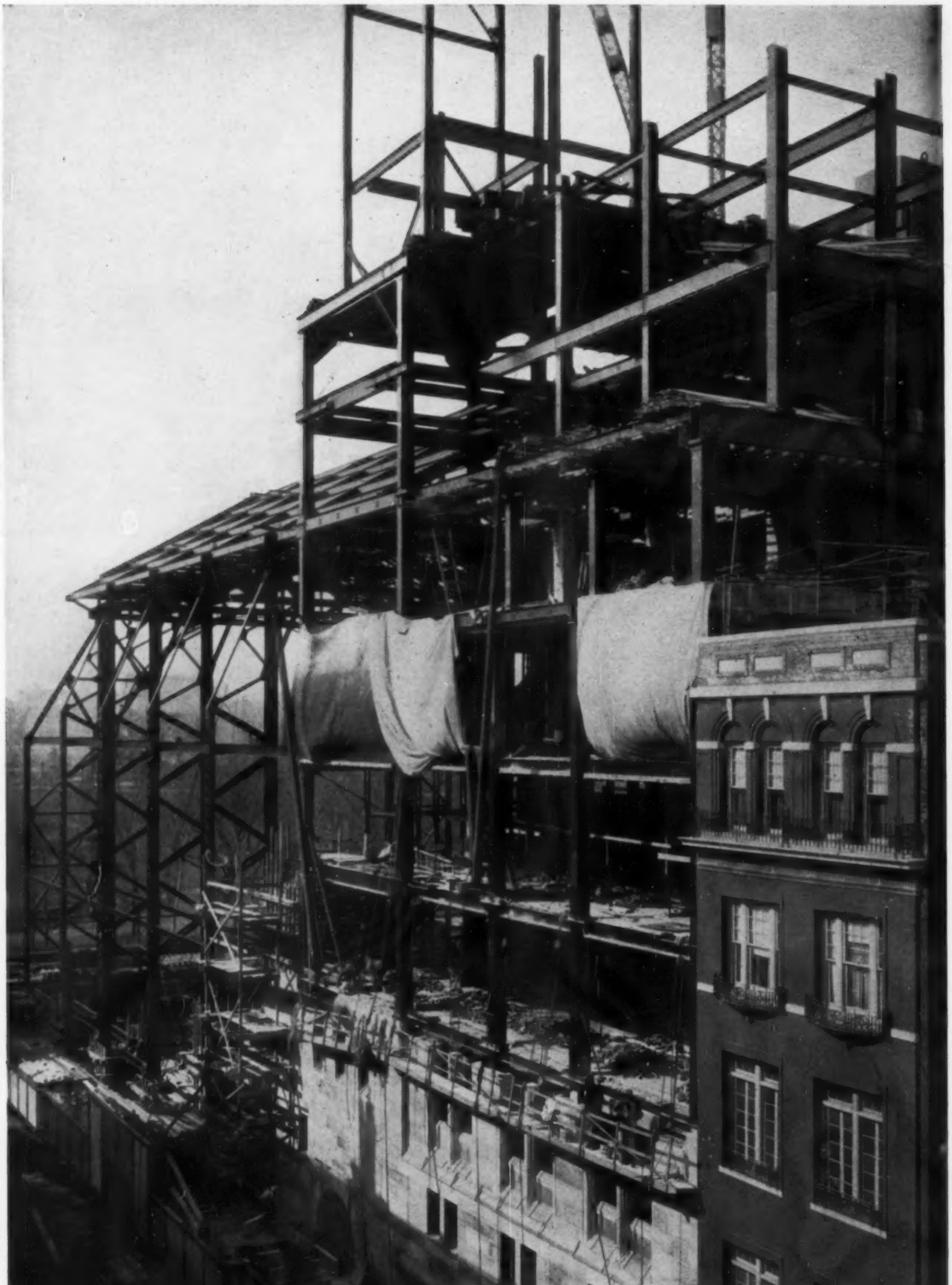


Diagram of Truss Supporting Community House



GENERAL VIEW OF STRUCTURAL FRAME
TEMPLE EMANU-EL AND COMMUNITY HOUSE

CHOOSING AND SPECIFYING LUMBER

BY

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LONG before King Solomon called on Hiram of Tyre for cedars of Lebanon and sent four score thousand woodsmen into the mountains of Judea to cut and hew timbers for his temple, wood was one of the most extensively used and important building materials. It still is. Not until the second decade of the twentieth century, however, was there available exact knowledge of its physical and mechanical properties.

Today conditions are different. As a result of the present keen competition, which is the life of modern business, lumber manufacturers, lumber distributors, engineering organizations, and research departments of the federal government have seen fit to lift the mystic veil enshrouding the properties of wood so that it may be compared property for property with competing materials. With this have come lumber standardization, plans for grade marking lumber, better merchandising, and the free advisory and consulting service of organized lumber manufacturers for the specifiers and consumers of their products in matters of lumber specification, procurement, and utilization. The aim of this article is to place before architects the technical information developed through research by such organizations as the American Society for Testing Materials, the U. S. Forest Products Laboratory, the Department of Commerce, and various trade associations, in a form that will be of practical assistance to them in the selection of woods, the designing in wood, and in writing the subsequent specifications. Wood is a product of nature, and no two creations of nature are exactly alike. Between the extremes there is considerable difference. The variations in lumber, except in rare instances, are readily discernible, however, so that it is possible to select, sort, and grade wood for a particular use with the assurance that the material will give satisfactory service. It is this service, this selection of the right kind, the proper grade, the right size of lumber for each of a multiplicity of uses, that is claiming the closest attention of progressive lumbermen, and this service is being offered the architect today.

Structure of Wood. Wood is a highly complex material, composed of masses of various types of tube-like cells. Some of these cells are thin-walled and adapted to the passing of liquids in the growing tree; others serve as food storage cells; and still others function primarily as strength tissue. Most of these cells have their long axes parallel to the main axis of the tree. In some species, however, as high as 25 per cent of the cells may have their long axes at right angles to the main axis, extending out like radii from the pith or center of the tree. These are known as "wood rays" and play an important part in the properties of wood. They also impart the beautiful figure to quarter-sawn boards of such woods as the oaks and gums. These variations in cellular structure, these anatomical differences, are responsible for the character and individuality of our different species of woods. It is due to these characteristic cellular differences that some species have a beautiful figure or grain, that some are resistant to impact, that some have great stiffness, that some are resonant, and that still others are capable of being bent and shaped into many forms, all demonstrating wood's great adaptability.

In the hardwoods or broad-leaved trees, such as oaks, maples, birches, elms, and basswood, the mixture of various types of cells is rather heterogeneous throughout each annual layer of wood laid down about the tree, though some have more uniformity than others. In the softwoods or needle-leaved trees, such as the pines, spruces, and firs, there is considerable uniformity in the type of cells. In the springwood they are usually large and thin walled. Later in the year the cells formed are smaller in diameter and have much thicker walls. The percentage of summerwood thus formed in Douglas fir and southern yellow pine, is readily discernible to the unaided eye, and is one of the most accurate criteria by which to judge the relative strength values of pieces of either species. Structurally there is little difference between sapwood, the living portion of the wood in a tree, and heartwood, the matured portion; and contrary to general belief, there is practically no difference in mechanical properties of otherwise similar materials. Sapwood is less resistant to decay than heartwood, but incidentally it is more readily treated with artificial preservatives. Straight-grained material, so desirable where strength is required, has the long axes of the cells parallel to two adjacent sides of the board or timber into which it is cut. Frequently the direction of these fibers is not parallel to the axis of the board, due either to the distortion of the fibers around a knot, that portion of a branch contained within the tree trunk; to non-uniform growth of the trunk of a tree; or to improper manufacture in the sawmill. Such material is termed "cross-grained," and when the slope of grain is pronounced it is unsuitable for use in heavy duty construction. The limits of permissible cross grain are defined in structural grading rules.

Knots in lumber may be either "tight" or "loose." Knots formed during the growing life of a branch are tight because of the close union between the fibers of the branch and those of the stem. When the branch dies, this close bond or union ceases, and the tree merely grows around the stub of the dead

branch. This type of knot is known as "loose" or "not firm," inasmuch as such knots may fall out during lumber seasoning processes. Knots in a quarter-sawn surface of a board are termed "spike" knots because of their long, slender appearance. Knots on a flat or plain-sawn board are oval or round. The locations and sizes of knots in material where strength is of primary consideration are important and always rigidly controlled by inspection rules. Lumber may contain other defects, some of one kind in one species, of another in others. Many of these have little no no damaging effect on the use of the piece, because their prevalence is also rigidly controlled by grading rules.

Dryness of Lumber. Lumber manufacturers today are devoting more thought, more skill, and more technical study to the seasoning of lumber than to any other one problem in its manufacture, due to the close relationship existing in wood between the degree of dryness and its various physical and mechanical properties, and suitability for various uses. When a tree is cut in the forest, sapwood may contain a greater amount of water by weight than wood substance. In the heartwood, water may be present to the extent of from 30 to 50 per cent of the oven dry weight of the wood. Boards cut from such material immediately begin to lose their moisture by evaporation. The percentage of water retained in the board depends entirely upon the humidity of the air to which it is subjected. In air with a relative humidity of 90 per cent, lumber will have an average moisture content of 22 per cent; at 60 per cent relative humidity, a moisture content of 12 per cent; and at 30 per cent relative humidity, a moisture content of 6 per cent. If the humidity of the surrounding air changes materially, then the moisture content of the lumber changes also. The rate at which this change takes place depends to some extent on the species involved, the protective coating of the wood, the dimensions of the piece in question, and the temperature and circulation of the air in contact with the wood. It is slow in any event. Change in moisture content is important as far as the properties of lumber are concerned. Loss of moisture below 25 per cent of the oven dry weight of the wood is associated with a decrease in size but with an increase in strength properties. The converse of this also holds true. The rate of change in moisture and method of change is also important. Too rapid a change in moisture content may cause uneven drying with subsequent warping or checking. The seasoning of lumber is, as a result, work which must be carefully supervised.

Frequently heard these days is the complaint "lumber is not seasoned as it used to be." It isn't! It is seasoned far better by the better mills of today than ever before. It is done accurately and under the supervision of skilled operators. There are two real reasons for the complaints mentioned. One of these is that many builders refuse to pay the slight additional cost of properly seasoned lumber and take chances with green lumber. Another reason is that the conditions to which lumber is subjected in the modern home are far more exacting than ever before. It is easy to recall the period when one or two rooms in a house were heated by a stove in the winter and the rest of the rooms were cold. Humidities were not low, and air-dried lumber would change but little even in the heated rooms during the winter. Living standards have changed. It is now quite generally the custom to heat all of the house to 70 or 75°. Relative humidities of 30 per cent or lower obtain for long periods with subsequent loss of moisture and shrinkage of wood not properly seasoned for these new conditions. It is not that lumber is poorer than it used to be or that it is not seasoned well; it is usually the fault of some individual who refuses to study the influence of this new era of well heated homes upon the requirements for dwelling houses. Lumber must be properly seasoned to stand the new conditions. Lumber conditioned by the manufacturer for particular uses can be shipped a long distance in box cars without appreciable changes in moisture content. Considerable responsibility therefore rests with the retail distributor and with the contractor. Kiln-dried flooring and finish should always be stored in closed, rainproof sheds. If a few steam coils are present, so much the better. Such stock should not be taken to a building until the windows and doors are in and the plaster has lost most of its moisture. If such precautions are taken, joints in the trim will remain tight and snug. Floors will not open up or squeak. The good service expected of lumber will be had.

Durability. The question, "what is the length of life that may be expected of wooden buildings?" cannot be answered in a simple statement of the number of years. Much depends on the species used, the possibility of there being insect and fungus attacks, mechanical injury and wear, the conditions under which it is used and permitted to be used, and so on. In Sweden lumber has long been abundant and extensively used as a building material. Today there are many Swedish buildings, built entirely of wood, put up in the latter part of the seventeenth and in the eighteenth centuries. Along our eastern coast in the older settled parts of this country there are many wooden structures from 100 to 200 years old. Frequently it is not deterioration of the material which determines the life of these buildings. A large number of our old houses have been torn down to make way for new buildings with modern improvements and conveniences, or for business structures. Obsolescence, therefore, accounts for much of the change from one type to another, from one material to another,—not depreciation of the material itself. The long natural life of some species, such, for example, as cypress, redwood, the cedars, and others, even under adverse conditions, is proverbial. The life of certain other species under conditions favorable to decay, is shorter. The sapwood of practically all species is not as resistant to

decay as heartwood. A listing, however, of the various species according to their relative durability is impractical because as yet there has been devised no scale for measuring this property. But a knowledge of decay will go far toward eliminating trouble from this hazard.

Decay. This may be caused by any one of several fungus organisms. These organisms put out thread-like roots or *hyphæ,* which pierce the cell walls, rendering the wood first brash and, in the most advanced stages, worthless. Decay can develop only where the temperature is satisfactory, where there is sufficient moisture, and where there is a certain amount of air. If any one of these three conditions is not favorable, fungi cannot develop. In normal building practice one condition that can be readily controlled is the supply of moisture. It is impossible for decay to develop in timber the moisture content of which is below 20 per cent if the fungi have no outside source of available water. Air-dry material, in any of the well developed sections of this country, will have less than 20 per cent moisture content. The problem therefore is to design structures so that moisture will drain quickly from all portions of the wood members and as far as possible to provide for a circulation of air around such members. This free air movement will keep the lumber below the critical moisture content. It is likewise important to see that wood members of structures do not come in contact with other wood members which are in contact with a supply of water unless the latter are treated with a preservative.

Preservation of Wood. Fortunately, scientific research has provided us with practical means for arresting the progress of decay or entirely preventing it, even under most adverse conditions, in woods normally not resistant to decay. This is brought about by rendering wood toxic to decay by impregnating it with a preservative material. There are two general types of preservatives on the market,—those which will not leach out of treated material even though such material be soaked in water for long periods of time, and those which will leach out if permitted to remain in water for an extended period. Creosote is the outstanding example of the non-leaching preservative. It is the most commonly used preservative in this country at present and is efficient against both fungus and insect attack. There are various methods of applying it, depending on the species of wood and the use for which it is intended. It is perhaps unnecessary to discuss it in detail here, but full information can be secured from the American Wood Preservers Association, 10 South La Salle Street, Chicago. A disadvantage of creosote is that it is oily and black. It should not be used where people will rub against it, nor should it be used where it is the intention to paint the wood. Where these two qualities are not objectionable, creosote is usually the preservative preferred at the present time in this country,—a preservative widely used.

Zinc chloride, a common preservative, second in importance to creosote, will leach out of treated material under certain conditions. It is, however, effective against both insects and fungi. Wood treated with it is clean and can readily be painted. Other meritorious preservatives such as certain salts, zinc meta-arsenite, and sodium fluoride, are also used in this country. Any of these preservatives will give splendid results when properly used. Zinc chloride, certain salts and sodium fluoride should not be used where treated material is subjected to a continuous leaching action of water. Under such conditions, creosote, zinc meta-arsenite, or a similar preservative should be used. Paint has long been considered a preservative by the layman. As a matter of fact, paint is not a preservative in the sense that it renders wood immune to fungus and insect attack. It does have preservative action in that it retards the weathering of wood exposed to the elements, protects it to a large degree from mechanical wear, and retards the absorption of water from the air. If a sufficient amount of moisture is present in the wood before painting, decay can progress behind the finest coat of paint. No plans or specifications for permanent wood construction should be considered unless they have been carefully checked to insure all members against decay, either through cutting off all sources of moisture necessary for the development of decay-causing organisms, or through the specifying of either naturally decay-resistant woods or properly treated material for members where hazard due to decay is otherwise unavoidable.

Mechanical Properties. In the selection of the kind of lumber for a given purpose, two considerations should be given precedence over the factor of cost. Consideration should be given, first, to securing members of the proper species and dimensions to satisfy the demands of strength and stiffness. Next should come attention to those requirements other than stress values, such as hardness and nail-holding strength which must be met in the design of the project. During recent years the U. S. Forest Products Laboratory has carried on an exhaustive series of tests of all commercial domestic species of lumber. A large number of these tests were made of small, clear pieces. To determine the influence of knots, shakes, checks and other types of defects, however, a sufficient number of tests were made of timbers of large sizes to establish the relation of these defects to strength properties. These data were used in the establishment of American standards for structural grades, generally accepted by the trade. The stress values in Tables 1 and 2, included here, determined by the U. S. Forest Products Laboratory, have been accepted by the American Society for Testing Materials, the American Railway Engineering Association, and the Bureau of Standards of the Department of Commerce. It is to be noted that different values are recommended for timbers of the same grade and species for different locations with respect to degree

TABLE 1

ALLOWABLE UNIT STRESSES FOR STRUCTURAL LUMBER AND TIMBER

Spices of Timber	Average Weight per cu. ft. at 12% M. C.	American Standard Grade	Allowable Unit Stress in Pounds Per Square Inch												
			Bending Stress						Compression Stress						Modulus of Elasticity
			In Extreme Fiber					Hori-zontal Shear	Parallel to Grain			Perpendicular to Grain			
			Usually wet 4" & thinner	Usually wet 5" & thicker	Occasionally wet 4" & thinner	Occasionally wet 5" & thicker	Continuously dry All sizes		Usually wet	Occasionally wet	Continuously dry	Usually wet	Occasionally wet	Continuously dry	
Cedar, western red	23	Select	670	750	710	800	900	80	650	700	700	125	150	200	1,000,000
		Common	570	600	600	640	720	64	520	560	560				
Cypress, red	32	Select	800	900	980	1100	1300	100	800	1000	1100	225	250	350	1,200,000
		Common	680	720	830	880	1040	80	640	800	880				
Douglas fir (Coast type)	34	Dense Select	1050	1165	1370	1515	1750	105	990	1165	1285	235	265	380	1,600,000
		Select	950	1065	1240	1385	1600	90	905	1065	1175	215	240	345	
		Common	750	800	980	1040	1200	72	680	800	880	200	225		
Douglas fir (Mountain type)	30	Select	620	700	800	900	1100	85	700	800	800	200	225	275	1,200,000
		Common	530	560	680	720	880	68	560	640	640				
Fir, (commercial white)	27	Select	710	800	800	900	1100	70	650	750	800	200	225	300	1,100,000
		Common	600	640	680	720	880	56	520	600	560				
Hemlock, west coast	28	Select	800	900	980	1100	1300	75	800	900	900	200	225	300	1,400,000
		Common	680	720	830	880	1040	60	640	720	720				
Hemlock, eastern	28	Select	710	800	800	900	1100	70	600	700	700	200	225	300	1,100,000
		Common	600	640	680	720	880	56	480	560	560				
Larch, western	36	Select	800	900	980	1100	1200	100	800	1000	1100	200	225	325	1,300,000
		Common	680	720	830	880	960	80	640	800	880				
Oak, (commercial white & red)	46	Select		1000		1200	1400	125	800	900	1000	300	375	500	1,500,000
		Common		800		960	1120	100	640	720	800				
Pine, southern yellow	39	Dense Select	1050	1165	1370	1515	1750	128	990	1165	1285	235	265	380	1,600,000
		Select	950	1065	1240	1385	1600	110	905	1065	1175	215	240	345	
		Common	750	800	980	1040	1200	88	680	800	880	200	225		
Pine, Norway	33	Select	710	800	890	1000	1100	85	700	800	800	150	175	300	1,200,000
		Common	600	640	760	800	880	68	560	640	640				
Pines, Calif., Idaho & no. white, lodgepole, pondosa, sugar	27	Select	670	750	710	800	900	85	650	750	750	125	150	250	1,000,000
		Common	570	600	600	640	720	68	520	600	600				
Redwood	30	Select	710	800	890	1000	1200	70	750	900	1000	125	150	250	1,200,000
		Common	600	640	760	800	960	56	600	720	800				
Spruce, red, white, Sitka	27	Select	710	800	800	900	1100	85	650	750	800	125	150	250	1,200,000
		Common	600	640	680	720	880	68	520	600	640				
Tamarack, eastern	37	Select	800	900	980	1100	1200	95	800	900	1000	200	225	300	1,300,000
		Common	680	720	830	880	960	76	640	720	800				

TABLE 2

SAFE LOAD IN POUNDS PER SQUARE INCH OF CROSS SECTIONAL AREA OF SQUARE AND RECTANGULAR TIMBER COLUMNS (*Dry Locations*)

Species of Timber	American Standard Grade	Ratio of Length to Least Dimension L/d										
		L/d 10 lbs.	L/d 12 lbs.	L/d 14 lbs.	L/d 16 lbs.	L/d 18 lbs.	L/d 20 lbs.	L/d 25 lbs.	L/d 30 lbs.	L/d 35 lbs.	L/d 40 lbs.	L/d 50 lbs.
Cedar, western red	Select	700	686	674	656	629	592	438	304	224	171	110
	Common	560	553	547	538	524	505	425				
Cypress, red larch, western	Select	1100	1063	1030	981	909	810	526	365	268	206	132
	Common	880	861	843	818	781	729					
Hemlock, west coast	Select	900	885	872	852	823	783	614	426	313	240	153
	Common	720	712	706	696	680	660	573				
Hemlock, eastern Fir, com'l. white	Select	700	689	678	664	641	611	482	335	246	188	121
	Common	560	554	549	542	530	515	449				
Oak, white and red	Select	1000	982	967	943	908	860	658	457	336	257	164
	Common	800	790	783	771	753	728	625				
Pines, Calif., Idaho & no. white, lodgepole, pondosa, and sugar	Select	750	733	718	695	663	617	438	304	224	171	110
	Common	600	591	583	572	556	532	434				
Pine, southern yellow Douglas fir	Dense Select	1285	1251	1222	1176	1112	1022	702	487	358	274	175
	Select	1175	1149	1127	1093	1045	975	702				
	Common	880	870	861	847	826	796	675				
Pine, Norway Spruce, red, white and Sitka. Douglas fir (mountain type)	Select	800	786	774	753	726	688	526	365	268	206	132
	Common	640	632	627	617	602	582	500				
Redwood	Select	1000	972	947	910	856	781	526	365	268	206	132
	Common	800	786	773	754	726	688					
Tamarack	Select	1000	976	955	923	877	817	570	396	291	223	142
	Common	800	788	777	761	737	706	566				

of dryness. In moist situations, treated material should be used to prevent decay. Tests have shown that creosote in itself does not weaken wood perceptibly, although the strength of wood can be influenced by carelessly performed treating processes. These strength data are of particular value to the architect. They have been reworked, for example, into tables showing the permissible maximum spans for joists and rafters of different sizes in the different species. These are obtainable from the National Lumber Manufacturers' Association, Transportation Building, Washington. Careful use of these authentic stress values in the designing of buildings leads to real economies, because the maximum utility value of lumber is realized.

Frequently factors other than the stress value listed in Tables 1 and 2 have an important bearing on the practicability of a given species for a given use. The degree to which it will "work" when in place, the ease with which it can be worked with tools and can be glued, its hardness, and its nail-holding strength, frequently determine the suitability of a wood for a given purpose. Wood from this angle is presented in Table 3. These observations are based on actual tests in the laboratory and the judgment of men long experienced in the use of wood. Attention is particularly called to the footnotes attached to Table 3 as an aid in the proper interpretation of the table. The Roman numerals do not necessarily indicate degrees of difference, and the values should be used with judgment. A sample piece full of knots, for instance, will not work as well as a clear specimen of any species listed.

TABLE 3

TABULATION OF CERTAIN PROPERTIES OF THE MORE IMPORTANT COMMERCIAL WOODS

Species	(1) Specific Gravity	Volumetric Shrinkage Green to Oven Dry	(2) Side Hardness	(3) Ability to Stay in Place	(4) Workability	(5) Nail Holding Ability	(6) Ease With Which Wood Can Be Glued
SOFTWOODS							
Cedar, Port Orford	.41	10.7	700	II	I	IV	II
Cedar, western red	.31	8.1	380	II	I	IV	II
Cedar, white	.29	7.0	340	II	I	IV	II
Cypress	.41	10.7	550	II	II	IV	II
Douglas fir (coast)	.45	12.6	810	II	II	III	I
Fir, balsam	.34	10.8	500	III	III	IV	II
Fir, western white	.35	10.2	460	III	II	IV	I
Hemlock, eastern	.38	10.4	490	IV	III	III	II
Hemlock, west coast	.38	11.6	620	II	II	III	I
Larch, western	.48	13.2	870	IV	II	III	II
Pine, Calif., white	.38	10.0	460	I	I	IV	I
Pine, Idaho white	.39	11.5	420	II	I	IV	I
Pine, loblolly and shortleaf	.50	12.6	860	II	II	III	I
Pine, longleaf	.55	12.3	1020	II	II	III	I
Pine, Norway	.44	11.5	600	II	III	IV	II
Pine, pondosa	.38	10.0	460	I	I	IV	I
Pine, sugar	.36	8.4	460	I	I	IV	I
Pine, white	.36	7.8	470	I	I	IV	I
Redwood	.41	6.3	520	II	I	IV	I
Spruce, red & white	.37	12.0	540	II	II	IV	I
Spruce, Sitka	.34	11.2	530	II	II	IV	I

TABLE 3 (Continued)

TABULATION OF CERTAIN PROPERTIES OF THE MORE IMPORTANT COMMERCIAL WOODS

Species	Specific Gravity	Volumetric Shrinkage Green to Oven Dry	Side Hardness	Ability to Stay in Place	Workability	Nail Holding Ability	Ease With Which Wood Can Be Glued
HARDWOODS							
Ash, white	.52	12.6	1320	I	I	I	III
Aspen	.36	11.1	460	II	II	IV	II
Brasswood	.33	15.8	450	II	I	IV	I
Beech	.54	16.2	1190	III	II	I	V
Birch, yellow	.54	16.8	1320	II	II	I	III
Cherry, black	.47	11.5	1030				
Chestnut	.40	11.6	580	I	I	IV	I
Cottonwood	.37	14.1	480	IV	II	IV	I
Cucumber	.44	13.6	790		II	IV	I
Dogwood	.64	19.9	2530	I	III	I	V
Elm, white	.44	14.4	870	II	III	II	I
Gum, black	.46	13.9	850	IV	III	II	II
Gum, red	.44	15.0	720	III	II	II	I
Hickory, shagbark	.64	16.7		II	III	I	IV
Maple, hard	.56	14.5	1430	II	II	I	III
Maple, soft	.48	12.5	990	II	II	II	V
Oak, red	.56	14.2	1310	III	II	I	III
Oak, white	.60	15.8	1370	II	II	I	I
Sycamore	.46	14.2	810	IV	III	II	II
Walnut, black	.51	11.3	1080	I	II	II	I
Yellow poplar	.37	11.4	450	II	I	IV	I
Mahogany				I	II	II	I

(1) Based on green volume and oven-dry weight.

(2) Side hardness load in pounds required to imbed a ball .444 inches in diameter one-half its diameter in wood.

(3) Represents a gradation from those woods which possess the greatest ability to stay in place under conditions of actual use (Class I) to those species which do not possess that quality to the same extent.

(4) Represents a gradation from those woods that can be worked with comparative ease (Class I) to those which present some difficulties in this respect (Class IV.)

(5) Represents a gradation from those which have the greatest nail holding power but have the greatest tendency to split (which necessitates the use of smaller nails) to those having the least nail holding ability but which are less likely to split.

(6) Woods in Class I are known to be used commercially in glued construction. Class II includes species about which little is known but which are not believed to be difficult to glue. Class III includes woods which are known to need a little more attention in gluing than Class I woods in order to get best results. Class IV includes woods which are known to present real difficulties in gluing. Class V includes those species about which little is known but it is believed they would present some difficulties in view of their similarity to species of known properties.

These are approximate values only.

Commercial Sizes of Lumber. A lack of appreciation of the manufacture of lumber on the part of the layman has been responsible for much questioning as to why the American Standard 1-inch yard board is 25/32 of an inch thick when dressed. The lumber manufacturer sets his saw, for example, to cut logs into boards exactly 1 inch thick. Due to the unavoidable variation in every mechanical operation, however, some pieces may be just under and some just over 1 inch thick. Before these boards are wanted by the consumer, they must be seasoned and usually brought to both uniform size and smooth finish. In these operations of sawing, seasoning, and dressing, 7/32 of an inch of lumber is required. The board originally 1 inch thick is hence 25/32 of an inch thick when it reaches the consumer, seasoned and dressed and ready for use. The seasoning process, however, increases the

TABLE 4

AMERICAN STANDARD LUMBER SIZES

(The thicknesses for any one item apply to all widths for that item, and the widths for any one item to all thicknesses for that item.)

Product	Rough Green Sizes (Board Measure) Thickness	Rough Green Sizes (Board Measure) Width	Dressed Dimensions Thickness Standard Yard	Dressed Dimensions Thickness Standard Industrial	Dressed Dimensions Width (Face Width Worked)
	Inches	*Inches*	*Inches*	*Inches*	*Inches*
Finish	..	3	5/16	..	2 5/8
	..	4	7/16	..	3 1/2
	..	5	9/16	..	4 1/2
	..	6	11/16	..	5 1/2
	1	7	25/32	26/32	6 1/2
	1 1/4	8	1 1/16	..	7 1/4
	1 1/2	9	1 5/16	..	8 1/4
	1 3/4	10	1 7/16	..	9 1/4
	2	11	1 5/8	1 6/8	10 1/4
	2 1/2	12	2 1/8	..	11 1/4
	3	..	2 5/8	..	..
Common boards and strips	1	3	25/32	26/32	2 5/8
	1 1/4	4	1 1/16	..	3 5/8
	1 1/2	5	1 5/16	..	4 5/8
	..	6	..	..	5 5/8
	..	7	..	..	6 5/8
	..	8	..	..	7 1/2
	..	9	..	..	8 1/2
	..	10	..	..	9 1/2
	..	11	..	..	10 1/2
	..	12	..	..	11 1/2
Dimension and joists	2	2	1 5/8	1 6/8	1 5/8
	2 1/2	4	2 1/8	..	3 5/8
	3	6	2 5/8	..	5 5/8
	4	8	3 5/8	..	7 1/2
	Over 4	10	Off 3/8	..	9 1/2
	..	12	..	..	11 1/2
Flooring	..	2	5/16	..	1 1/2
	..	3	7/16	..	2 3/8
	..	4	9/16	..	3 1/4
	1	5	25/32	..	4 1/4
	1 1/4	6	1 1/16	..	5 3/16
	1 1/2	..	1 5/16	..	..
Bevel siding	..	4	7/16 (Min.) x 3/16	..	3 1/2
	..	5	10/16 x 3/16	..	4 1/2
	..	6	..	..	5 1/2
Rustic and drop siding (shiplapped)	..	4	9/16	..	3 1/8
	..	5	3/4	..	4 1/8
	..	6	..	..	5 1/16
	..	8	..	..	6 7/8
Rustic and drop siding (D. & M.)	..	4	19/16	..	3 1/4
	..	5	3/4	..	4 1/4
	..	6	..	..	5 3/16
	..	8	..	..	7
Ceiling	..	3	5/16	..	2 3/8
	..	4	7/16	..	3 1/4
	..	5	9/16	..	4 1/4
	..	6	11/16	..	5 3/16
Partition	..	3	3/4	..	2 3/8
	..	4	..	..	3 1/4
	..	5	..	..	4 1/4
	..	6	..	..	5 3/16
Shiplap	1	4	25/32	..	3 1/8
	..	6	..	..	5 1/8
	..	8	..	..	7 1/8
	..	10	..	..	9 1/8
	..	12	..	..	11 1/8
Dressed and matched	1	4	25/32	..	3 1/4
	1 1/4	6	1 1/16	..	5 1/4
	1 1/2	8	1 5/16	..	7 1/4
	..	10	..	..	9 1/4
	..	12	..	..	11 1/4

strength of wood to such a degree that the wood lost in smoothing the surfaces of a board is compensated for. The dressed board of 25/32 of an inch is therefore as strong as a 1-inch green board, and in addition is smoothly finished, ready for use. The development of standard sizes for commercial lumber is recent, begun in the year 1922 under the direction of the Secretary of Commerce at the instigation of leaders in the lumber industry. Previous to that time the lumber sizes of one association did not necessarily correspond with the sizes of another. Much depended on local conditions. The owners of some mills saw fit to manufacture heavy lumber. Others preferred to manufacture thinner material. Standardization has reconciled these differences, and it is now possible to order and secure lumber manufactured to American Standard sizes from mills in any part of the country. The economies made effective by this standardization of lumber sizes, to the manufacturer, to the distributor, to the architect, and to the consumer, are quickly apparent.

The green or nominal sizes and the dressed sizes of American Standard yard lumber are given in Table 4. The dressed dimensions for structural lumber are 3/8 of an inch less than the nominal sizes for material from 2 to 4 inches in thickness and 7 inches or less in width. For widths of 8 inches or more of lumber 2 to 4 inches thick, and in lumber of all dimensions 5 inches and thicker, the dressed sizes are 1/2 inch less than nominal. Uniform workings for flooring, siding, ceiling, partition, and dressed and matched material, and standardized patterns for mouldings are both incorporated in the American Standards. The mouldings present good architectural design and are economical to produce. They are known as the "7,000 Series," and catalogs can be obtained on request from local lumbermen or from the National Lumber Manufacturers' Association.

Measurement and Shipping Provisions. Not only do the American Standards for Softwood Lumber cover manufacture, sizes, patterns, and workings as just discussed, and such lumber qualities or grades as will be described later, but they also cover the important features of universally accepted commercial species and nomenclature; uniform methods of description, measurement, and tally; practical shipping provisions; and standard association inspection services. Some of these aspects of the national standards for lumber enter into specification writing and are therefore of direct interest to the architect.

Grades of Yard Lumber. The untold value of our timber resources lies not alone in their vastness and the fact that they can be and are being renewed, but in the quality and the great variety of different species of trees. There are, in fact, 1,177 different known trees making up our forests. Of these 480 grow to merchantable size. Many produce lumber of similar characteristics, quality, or utility value, bringing about the recognition in commerce of 60 or more individual species or groups of different species of hardwoods, and 30 or more individual species or groups of similar species of softwoods. This gives the architect and the consumer of lumber a wide variety from which to select the woods most suitable for his needs. The very fact, however, that there are so many quality woods available, each varying in one or more properties from the others, made the standardization of grades of softwood yard lumber more difficult than the unification of yard lumber sizes or any of the other aspects of lumber standardization so far described. In fact, variations in methods of manufacture, in inherent quality, and in prevailing types of defects, give rise to differences in general utility value among the soft-

TABLE 5

SYNOPSIS OF AMERICAN STANDARD LUMBER BASIC GRADES FOR YARD LUMBER

Grade	*Quality*	*Chief Uses*
A Select	Practically free from defects.	Highest type of natural finished interior trim and woodwork, of flooring in some woods, of ceiling and partition, and of exterior siding.
B Select	Small defects, principally knots or small pitch pockets, and slight manufacturing defects.	Excellent quality of natural finished interior trim and woodwork, and the highest type in many woods; excellent flooring and for other interior uses, and for painted exterior trim and siding.
C Select	Slightly more and slightly larger defects than in B Select, not exceeding medium in size or character, with some manufacturing and seasoning defects, all coverable by paint.	Best quality painted interior trim and woodwork, exterior uses, and often serviceable for natural finished interior trim.
D Select	More and larger defects than in C Select; none causing waste or detracting from a finished appearance when pointed.	Universal grade for those uses always painted, and particularly where only one side and two edges of the piece show.
No. 1 Common	Tight knotted, sound stock with size of defects and blemishes limited, not necessarily as perfectly manufactured as Select lumber, but always usable without waste.	Suitable for the highest type of general utility and construction, both in boards and dimension; often suitable for painted exterior trim, and in products such as flooring, ceiling, and siding for interior uses not required to be of highest quality.
No. 2 Common	Allows somewhat larger and coarser defects than No. 1 Common, mostly tight with occasional loose knots and decay discolorations, and some imperfections in manufacture, and usable without waste.	Suitable for general utility and construction purposes both in boards and dimension; and the most suitable grade for construction not of the highest type, or of a temporary character.
No. 3 Common	Allows larger and coarser defects than No. 2 Common, and occasional knot holes, decay and wane. Permits some waste in its use.	Suitable for temporary construction, many parts of small buildings, and in some woods for sheathing and similar purposes in the best construction.
No. 4 Common	Admits the coarsest defects such as decay, holes, and wane, and permits waste in its use.	Suitable for many uses but not of particular interest to the architect.
No. 5 Common	Must hold together in ordinary handling	Suitable for many uses but not of particular interest to the architect.

woods which, it was found, could not be completely reconciled by standardization.

Prior to lumber standardization, manufacturers sorted lumber according to their own ideas and markets. Often the definitions and terminology of grades were indefinite and unlike. From this rather chaotic state, groups of manufacturers producing a limited number of woods compiled and published association grading rules for their own woods. This was the first step toward national standardization and represented great improvement over conditions obtaining early in the history of the lumber industry. With these association grading rules as a guide in the lumber standardization movement, which was instituted and carried on by all branches of the industry itself under the encouragement and auspices of the Secretary of Commerce and with the aid of the Department of Agriculture, basic grade classifications applicable to all softwoods cut into yard lumber and factory lumber were formulated. Association grading rules have now been brought into general conformity with these basic classifications, so that all commercially important softwoods are now available in American Standard grades.

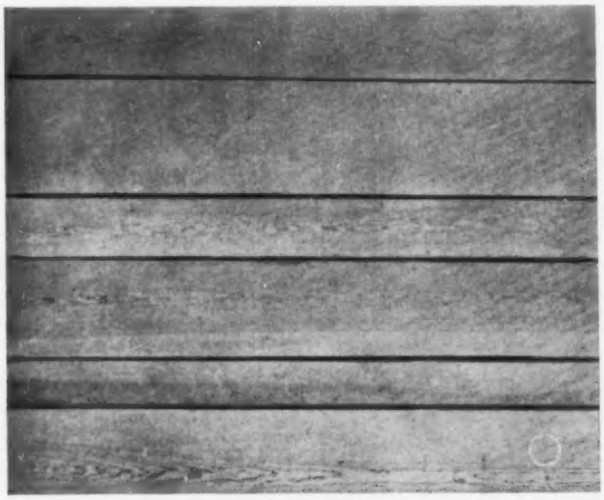
Specifying the Correct Grade. Along with grades of structural lumber described here, yard lumber grades are of vital interest to the architect. Yard grades are based on the number, size, and character of the defects permissible in each piece. These are determined by the requirements of the majority of uses for each grade. The use-value of different woods is dependent upon the respective physical and mechanical properties and methods of manufacture, prevailing types of defects, etc., of the different woods. Consequently, in making selection of the proper wood or woods and the most suitable quality for a given use, the architect must take both the quality of the grade and the utility value of the wood into consideration. The foregoing discussion and tabular data are designed to supply information on the comparative utility values of the different woods. As a guide to the architect in selecting the general grade quality of material applicable to his needs, Table 5 has been prepared. It is an amplification of the American Standard basic grade classifications for yard lumber and describes in general terms the character of each yard grade of the commercially important softwoods and some of its chief uses.

Grades of Structural Lumber. The American Standards also incorporate basic provisions for the selection and inspection of softwood dimensions and timbers where working stresses are required. The grading of such material is different from the grading of yard lumber, in that not only are the number, form, and size of defects considered but also their location with respect to the different faces and ends of the pieces. In addition, the comparative density of the material is important. The influence of defects gives rise to two basic structural grades,—Select and Common. More serious limitations are placed on defects permissible in the former than in the latter. When, however, the factor of density is added, two more grades are made possible, one of which, besides being of Select material, is dense, and the other, besides being of Common material, can likewise be dense. The Standards now provide for three of these grades,—Dense Select, Select, and Common. Dense Select material is the highest grade. It must average either on one end or the other, six rings of annual growth per inch, and in addition one-third or more summerwood. If 50 per cent is summerwood, 5 rings per inch are sufficient. It is found only in southern pine or Douglas fir, and is requisite for uses where great strength

and stiffness are required, such as for bridge timbers, beams and posts in heavy timber mill constructed buildings, etc. The second grade is Select. It must have the rings of the Dense grade but not the summerwood. It is suitable for a large number of general construction purposes, and is available in all softwoods producing structural material. The other American Structural grade is Common and is not selected for either number of rings per inch or per cent of summerwood. It is suitable for a great many structural uses where strength is a consideration but not a prime requisite. It is also available in all structural woods. The density rule of rings per inch and percentage of summerwood may also be applied to material otherwise of Common quality, giving rise to a grade of Dense Common.

The importance of the effect of certain defects and their location in the piece varies, however, according to the character of the use. The limitations with regard to permissible defects are somewhat different, therefore, in material used as joists or planks, as beams or stringers, or as posts or timbers. These different use requirements are likewise recognized in the American Standards, so that in each of the three Standard grades just mentioned there are three so-called use-grades of the character just described. The employment by the architect and lumber specifier of the proper structural grade, therefore, requires judgment.

Advisory and Consulting Service. Progressive lumber manufacturers throughout the country have realized for some time that if lumber is to render its maximum service, they must make available to the architect who specifies lumber, technical advice and consulting service of a staff of engineers and specialists familiar not only with the problems of the users of lumber but also versed in the properties and uses of lumber in their various special fields. During the past year such a group of trained men has been brought together. An expert is stationed in each region to discuss the architect's problems, to advise in regard to the kind and size of lumber, the sources of good lumber, and the proper way to specify and procure it.



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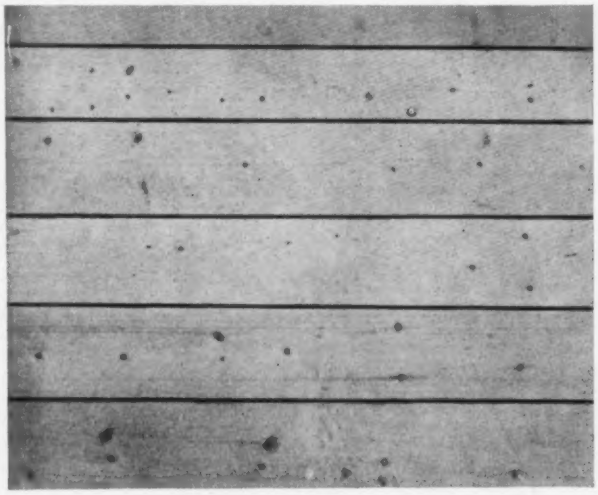
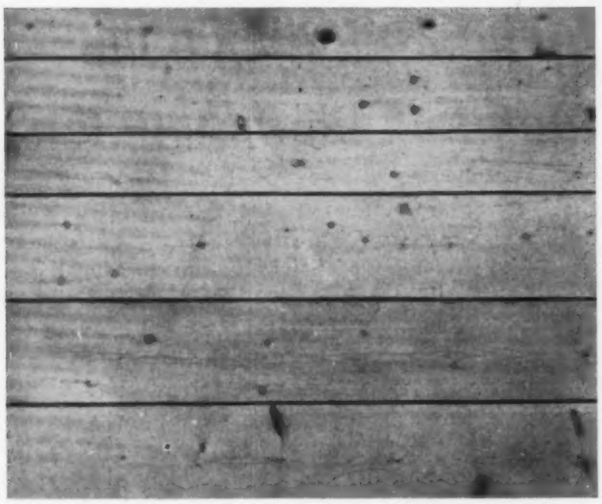
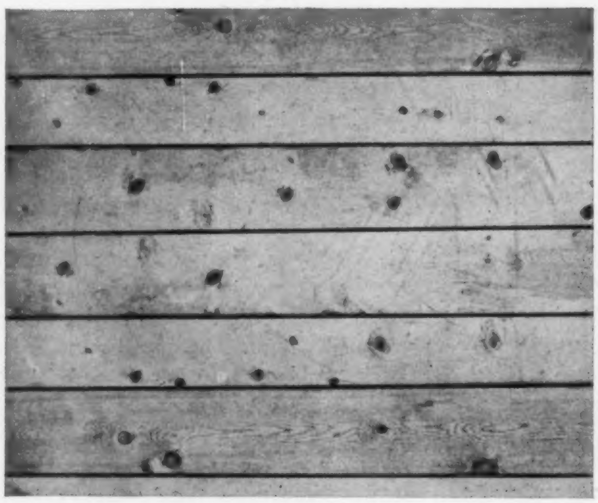


No. 1 Common



No. 2 Common



No. 3 Common

Some Typical Grades of Yard Lumber

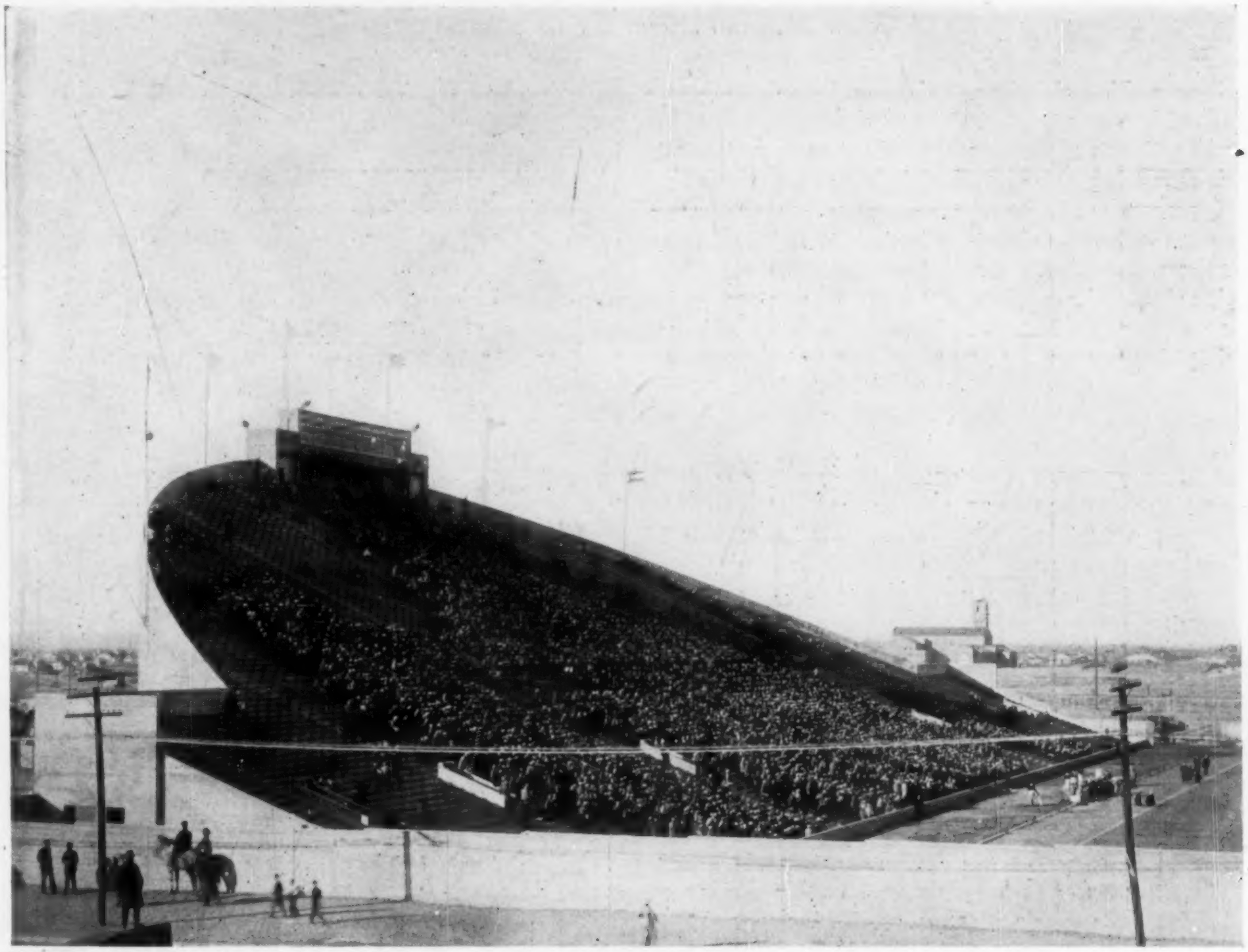
THE UNIVERSITY OF DENVER STADIUM

W. E. & A. A. FISHER, ARCHITECT

GAVIN HADDEN, CONSULTING ENGINEER

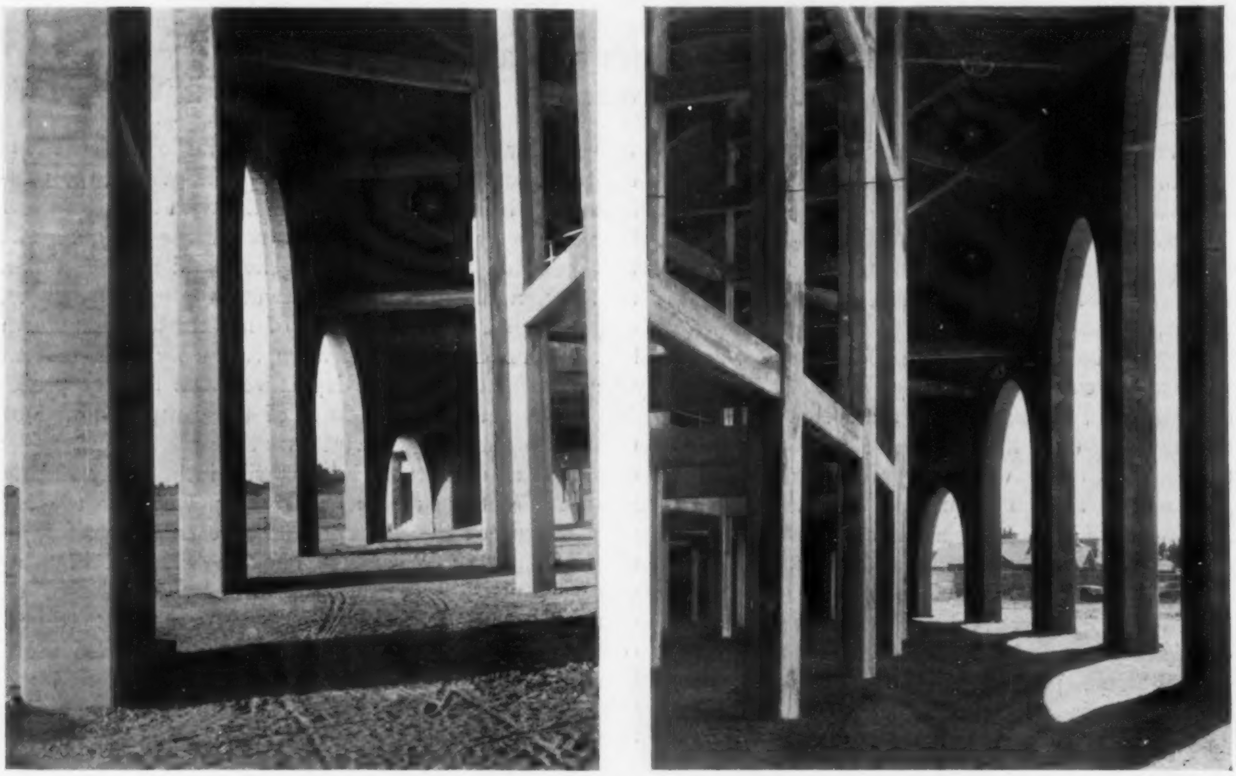
THE University of Denver Stadium, shown in the accompanying illustrations, has at present about 31,000 permanent seats for football and track games. The structure is built in two parts, located on opposite sides of the arena, and the completed west side alone seats about 25,000 spectators. With the completion of the east side, therefore, the capacity will be increased to about 50,000 seats, and still further increases may readily be made, temporarily or otherwise, at the ends of the arena.

The design of this structure shows the modern tendency to differ widely from such ancient examples as the Roman Colosseum or the Panathenaic Stadium in Athens to meet more adequately the conditions and requirements of the modern games for which it is principally used. Not long ago there was a definite architectural prejudice against the division of a monumental structure of this kind into two separate parts without making physical and structural connection at one end or at both ends of the arena. Such connections were regarded as necessary for the attainment of unity in design, and it is only recently, comparatively speaking, that the realization has been reached that the field or arena itself is properly the central feature of the design. The arena itself, with its playing field and running track, forms a connecting link between the two structures, just as surely as the nave of a cathedral may form the connecting link between two lofty disconnected spires. Still further departure from ancient precedent is found in the form of the completed part of this structure. Spectators at football games, for whom this structure is primarily intended, generally desire seats located as close as possible to the 50-yard line of the gridiron and as close as possible to the center of the field. This has resulted in principles which determined previously the design of such structures as the Cornell Crescent at Ithaca, the Brown Stadium in Providence, and also more recently the Dyche Stadium at Evanston, and the Municipal Stadium at Asbury Park. The exterior wall, which in plan forms a circular curve centered

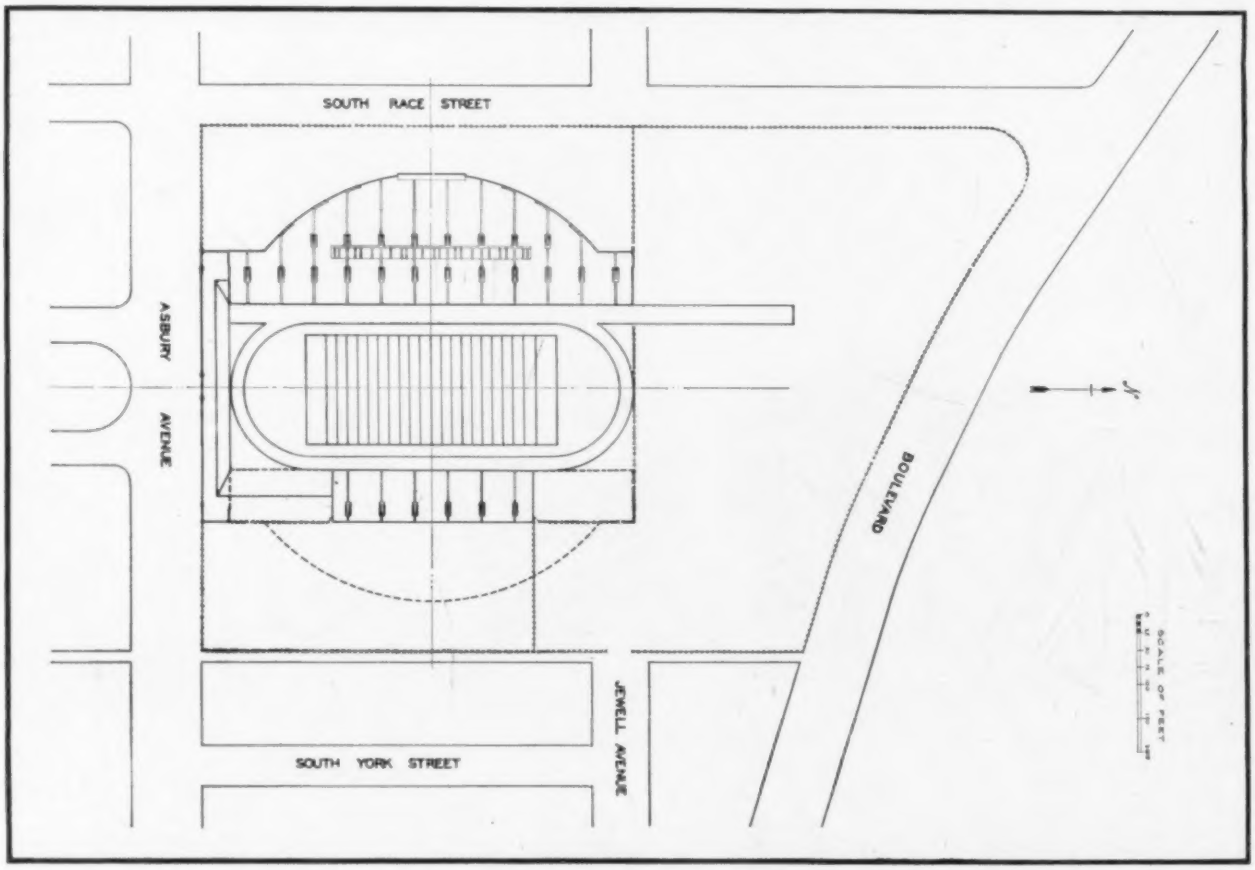


Photos. Louis H. Dreyer

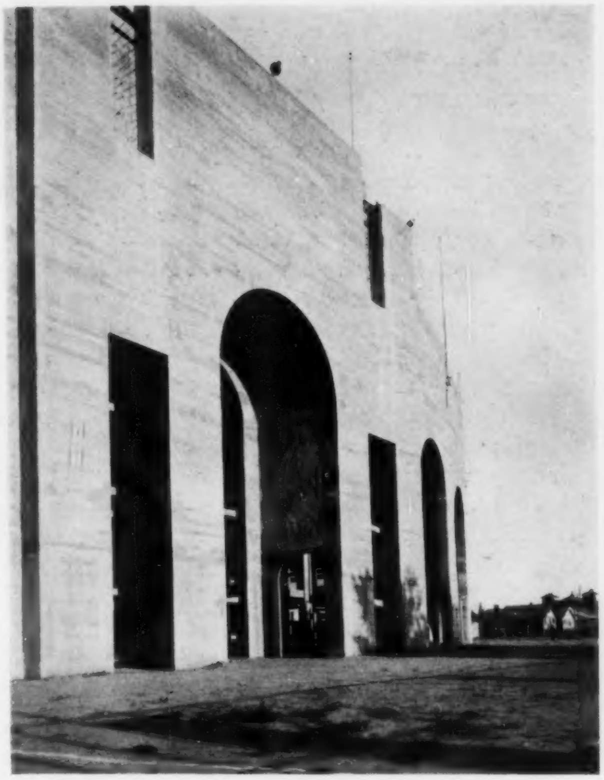
View of the Stadium from Asbury Avenue



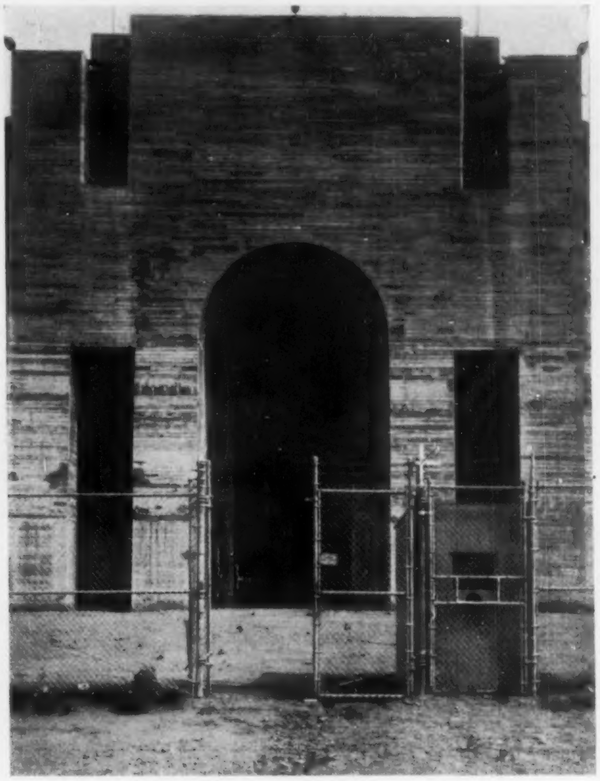
VIEW SHOWING SIMPLICITY OF CONSTRUCTION



GENERAL PLAN, DOTTED LINES SHOW POSSIBILITY OF ENLARGEMENT



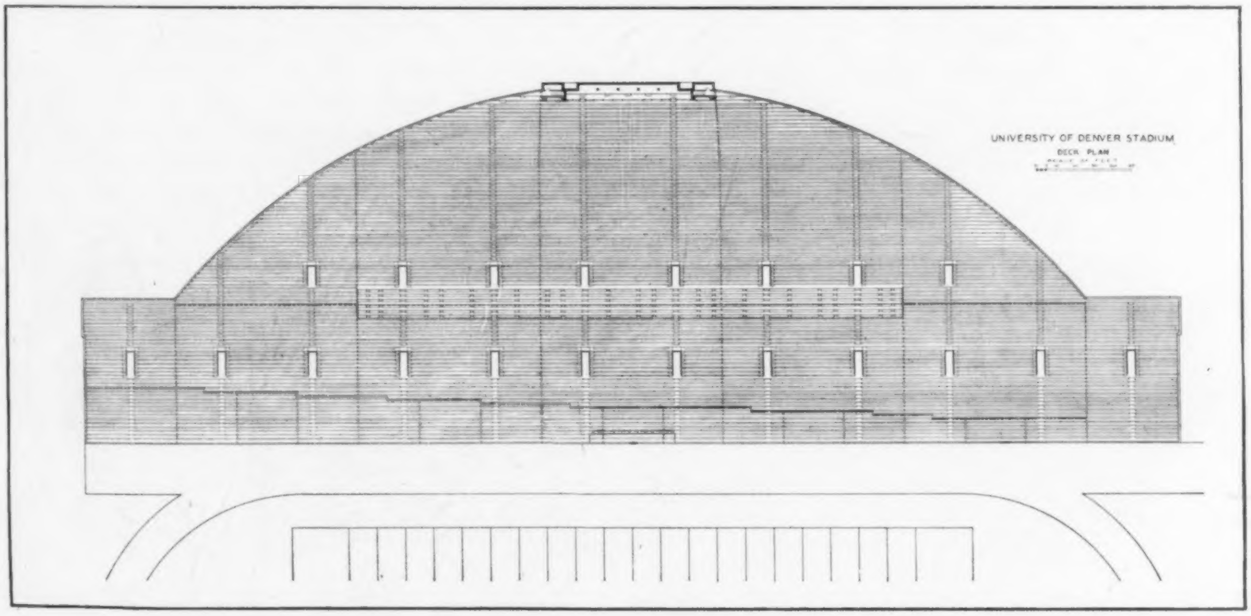
Entrance to Portals



Gate and Entrance

on the middle of the football field, terminates the rising tiers of seats and thus forms a curved skyline which is the most distinctive feature of the arena, particularly well suited to the use of reinforced concrete, of which the structure is built. Still further distinction is added to the skyline curve in its exterior elevation by the continuous succession of ascending and descending arches piercing the outside wall.

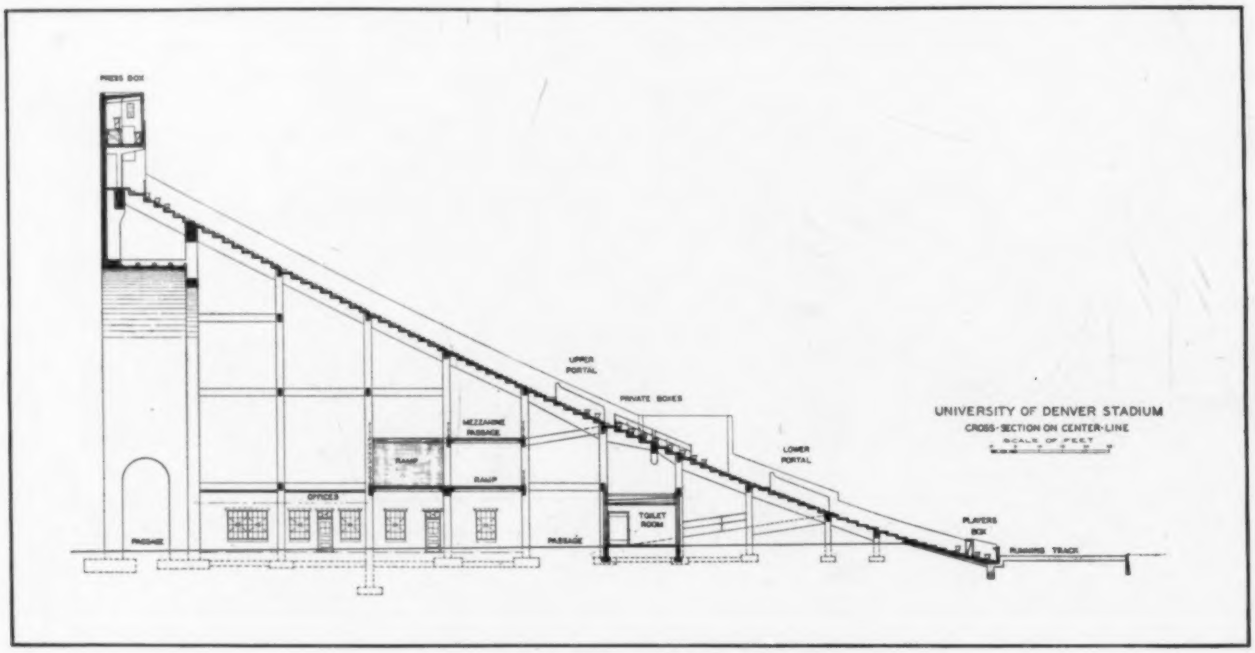
An interesting lesson has been learned from recent use of the stadium, which serves still further to prove the soundness of this design. The private boxes, as shown clearly in the plan, are located in two longitudinal rows, part way up the stand, extending approximately from goal line to goal line. There has been so much demand for the centrally located boxes, and so little demand for those nearer the



Plan of Stadium; Press Box at Top; Private Boxes in Center

Space Under Stands, Used for Offices, Team Rooms and Service

ends, that it indicates definitely that the same general principles might well be followed in box location as in the location of the ordinary seats, placing a proportionally greater number of boxes opposite the central part of the field. The drawing of the cross-section of the stadium shows that the first row of seats is close to the level of the track and field. This enables the spectators to obtain a good view of all runners on the running track, even though this first row of seats is located close to the boundary of the track; this arrangement of seats at the same time reduces the distance of the average and maximum view at football games. The running track itself was designed according to the best practice, developed and improved from experience elsewhere, and the excellence of the results was attested by the



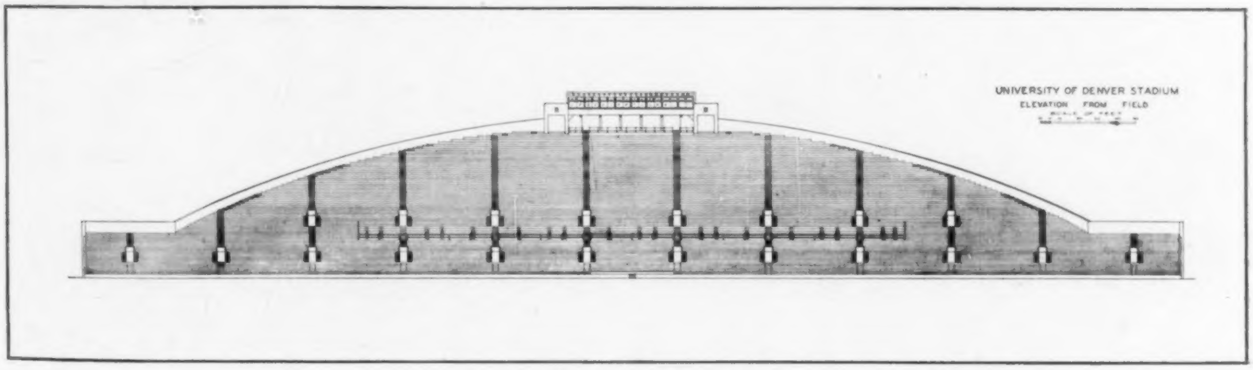
Cross-Section on Center Line of Stadium

The Large Protected Press Box

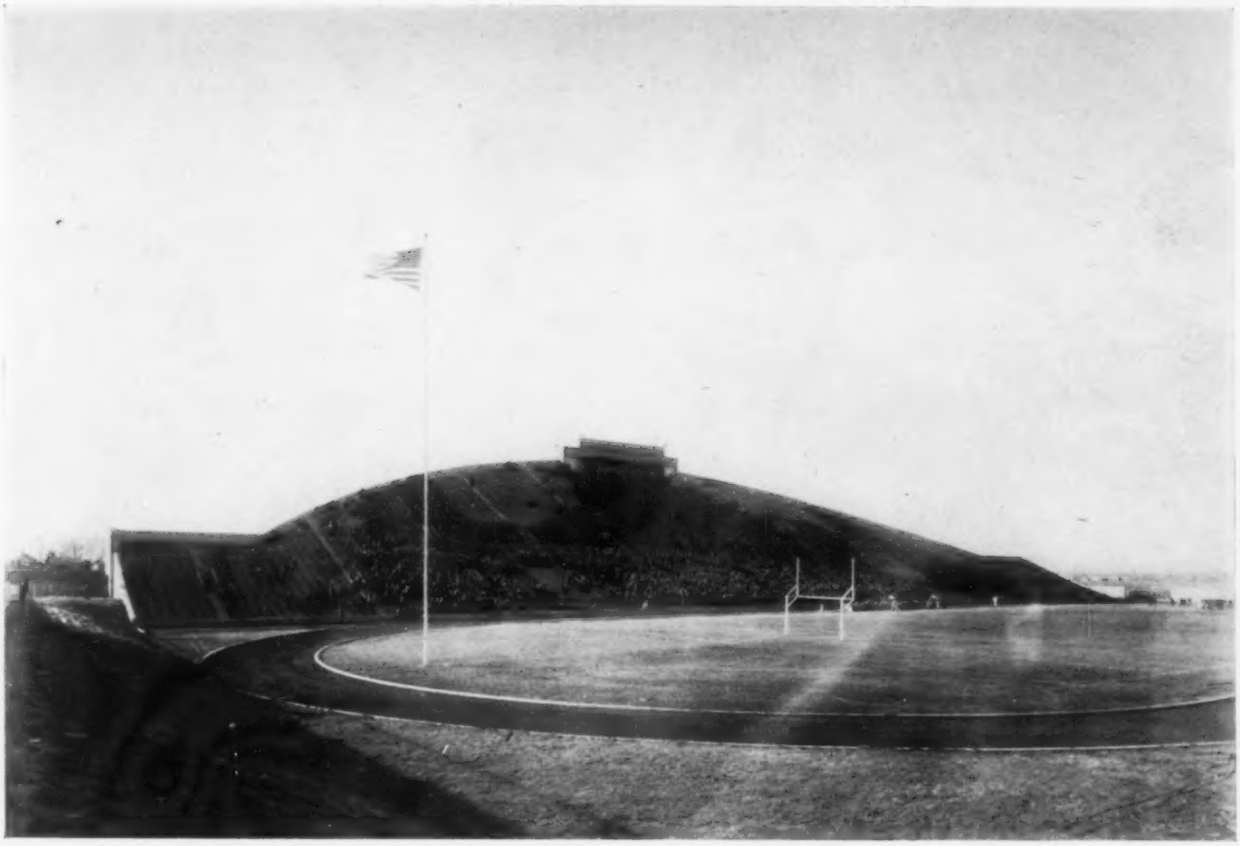
records attained at the very first of the track meets.

The entrances and exits are located in two longitudinal rows at intermediate elevations on the deck. The upper portals are fewer in number than the lower and serve only the upper part of the deep central portion of the deck. As all except one of the lower portals are reached by ramps extending up from the ground under the structure, nearly all the spectators can go to and from their seats with comparatively little exertion, the only steps being those located in the aisles in the deck. The circulation facilities have been carefully designed to provide safety, comfort and convenience, and the entire stadium can be emptied of a capacity crowd in a few minutes without there being undue congestion.

Other interesting features of this structure, some of which are shown in the illustrations, are the press box, with its many conveniences; the players' boxes; the expansion joints; the drainage system; and the extensive use for interior rooms which has already been made of a large part of the space under the seating deck. In addition to the space required for the ramps and passages for the circulation of spectators, the completed part of the structure houses spectators' toilets, rooms for players, a large lounge room, coaches' and trainers' rooms, a laundry and dry room, a caretaker's room, administration offices, and a dining room and kitchen for training tables. One important use of the stadium is for civic events, some of which may require only a small stage or arena, and the form of the structure makes it also particularly advantageous for such purposes, since a majority of the seats are concentrated within a small distance of one spot.



Elevation from the Field



VIEW OF THE STADIUM FROM THE FIELD

VIEW IN A ROOM UNDER STADIUM SEATS

EQUIPMENT OF THE SMALL HOUSE

BY

URBAN F. PEACOCK

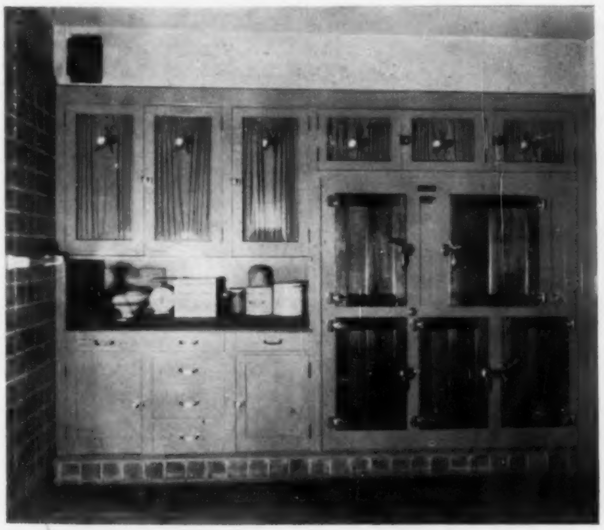
OF PEACOCK & FRANK, ARCHITECTS

DUE to changed economic conditions, planning the average house today presents to the architect a problem entirely different from what it did a generation ago. Today the architect's responsibility is not limited to supplying artistic design, style or appearance; these must be provided, of course, but along with them he must consider the increased demand for modern facilities for health and comfort. Nor is it enough that the architect provide only such of these facilities as are demanded by his client. He must also anticipate the needs of his client and tactfully call attention to them, all of which is strictly in keeping with the modern demand for service and the trend of modern practice.

The growing desire for comfort and efficiency has been more pronounced with reference to the planning of the medium priced house than with the larger and more expensive residence. The reasons underlying this demand are obviously brought about by the rise and rapid increase in the number of a class of highly specialized technical workers,—the doctor, the lawyer, the professor, the engineer, the department head, the junior executive, etc.,—in a word, the great class of men who are trained but who have to work at small salaries during the earlier years of their careers. They belong to the class whose incomes range from $5,000 to $15,000 a year, a group which, income tax returns show, has grown enormously in the last decade. The medium priced home represents, usually, the life-long ideal of these people. It has been the goal of the man and his wife, usually a well bred woman, since the days when the salary had to be carefully budgeted, to make it cover the monthly expenditures. Enduring the discomforts of living in quarters in a district where rents were commensurate with the size of the pay check, a man of this type and his wife have had the thought of home constantly before them. "When we build a home of our own" has been a daily phrase in their household. All of their dreams have centered about it. They have worked and economized for years in order to achieve it. Happiness, to these people, is symbolized by "a home of our own."

The architect should remember, in dealing with this type of clients, that he is not dealing primarily with the man. He is dealing with the man and his wife,—and the wife is going to have a great deal to say in the matter. Naturally, planning a home for them entails more than style or design. They want the artistic, of course, but that is not all; first of all they want *comfort*. During the years of discomfort which the wife has undergone in rented houses, she has formulated a very definite idea of what a home of her own was to be when she and her husband could afford to build it. She has subscribed to magazines which deal with home building, and from them she has learned a great deal about style and various types of architecture, home equipment and planning. In her mind's eye she has already built the home about which she now consults the architect, and she demands that he give her something which agrees with it. In order to do this, the architect must attack the problem of home planning from the wife's point of view. In other words, he must begin with her three major considerations: comfort, style and efficiency. The arrangement of all the rooms, in fact, must be made to conform to her artistic taste and her demand for modern convenience.

The plan of the house in general must be such that it saves her or her servants as many steps as



Refrigerator and Kitchen Cabinet Combined

Range in a Well Appointed Tile Kitchen

possible. The kitchen must be conveniently located with reference to both front and rear entrances; the bathrooms must be convenient to the bedrooms. There must be a lavatory on the first floor, located so that the children can get to it and to their play room without going through the main rooms of the house when they come in from out of doors. There will be no left-handed sink in her kitchen; interior doors will swing the right way; the cupboards will be located in the most convenient places; there will be an incinerator, and the modern electric refrigerator will conform to her desire to reduce the number of necessary steps to a minimum. There must be a sufficient number of base plugs in the proper places for floor lamps, vacuum cleaner, iron, toaster and other electrical appliances. Ornate mouldings which catch dust and are difficult to clean must go into the discard. Interior door sills are no longer desired, because of the hindrance they present to cleaning, and the danger they represent in tripping. Modern heating cabinets skillfully concealed in the paneling or beneath windows and cupboards may replace the ugly, old radiators, for the modern woman has read about them and wants them.

She demands proper ventilation and frequently is familiar with the various devices that have been created to improve it, particularly in the kitchen and in the sleeping rooms. Women, particularly those who read the current magazines, have become fairly well versed in knowledge of modern home management, and their education in this direction is reflected very noticeably in architecture. She knows about insulating the house against the winter cold. The heating plant is not a mystery to her; she knows that she can heat economically without the shoveling of coal. Thus it is the business of the architect to be well posted on the devices which have been designed to make the house more comfortable, more efficient and more liveable. Architects must know what all these devices are, what they provide, and what it costs to install them, and they must be able to tell their clients in detail just what they will accomplish; and while it is not the duty or even the function of the architect to attempt to promote the installation of these devices, it is his business to give the client what he or she wishes, and it is his duty for the sake of his profession to be able to assist the client in properly planning the house and to safeguard him or her against overlooking things which the architect knows will be wanted when the new house is completed and occupied.

Such a house must be equipped with all modern devices, both those in general use today and those which will be generally demanded tomorrow. Of all the defects or inconveniences which may creep into a finished modern house, probably the worst is improper heating. Defective heating may be brought about by lack of radiation, not enough boiler capacity, improper distribution of radiation, or lack of heat control. The steady development of the principle of heat control has brought this country to a point where almost everyone has heard of automatic heat regulation and the assurance it gives of health and comfort. A few years ago the average man or woman planning a medium priced house would never have thought of asking for automatic heating control. In the last four or five years particularly, it has shown a remarkable growth. People have come to recognize the regulator as a device which will render comfort, and in climates where sharp temperature changes are frequent, people understand that the uniform temperature assured through automatic heat regulation is a real protection to health.

Many people have heard of automatic heat regulation but are not entirely familiar with its principles. They do not understand that even though heat regulation is not immediately contemplated, the wiring at least should be installed at the time the house is wired for electricity, thus saving bother and worry at some later date. The architect must be able to explain in detail just how an automatic heat regulator can be installed in the house. The family may have one or two small children for whose health the mother is very much concerned. Dr. C.-E. A. Winslow, Professor of Public Health, Yale University, has shown that childhood illnesses and the incidence of contagious diseases are closely correlated with room temperatures. In an extensive study of the subject he found that children kept in rooms in which the temperature was above 68° Fahr. showed a much greater susceptibility to disease than did children kept in rooms where the temperature was maintained at 66° or 68°. The results of research have been widely published in women's magazines, and a woman of the type being considered here is probably familiar with them.

Devices which have to do with refrigeration, control of humidity, ventilation, heat regulation, etc., are coming into general demand among modern home builders. The last five years have seen this demand double, treble and quadruple. The architect, therefore, who is keeping abreast of the progress of his profession, must familiarize himself with the best and latest that is being offered, for their importance in the home is coming to be looked upon as fully as great as the importance of design or decoration. Comfort and health are assuming importance in daily life. They are becoming major considerations in home planning. The architect, therefore, must consider them and place upon them the emphasis which they are receiving in the minds of this generation. Economic conditions have given rise to higher standards of living. Demands must be catered to, and architects must know and meet them.

OFFICE PRACTICE

THE ARCHITECT'S BUDGET

AN ADDRESS BY

EDWIN BERGSTROM

THE SIXTY-FIRST CONVENTION OF THE AMERICAN INSTITUTE OF ARCHITECTS, HELD IN ST. LOUIS, MAY 16-18, 1928

ARCHITECTURE is a busy profession. Without doubt there enter into it more of business and detail of business administration than enter into any other profession. It is not a true profession in the sense that the other fine arts are professions. The musician, painter and the sculptor create with their own hands their finished art, but the architect would make a sorry showing if he should build his dreams. Of all professions, his alone must depend upon others to give form and substance to his art. Architecture is further differentiated from the other professions. The architect creates his art to satisfy a definite need; the sculptor and painter to satisfy their own imaginations. There must be definite need for his creation before the architect can begin his work of art, and simultaneously there must be furnished a sum of money, with which and within which the architect must work.

Architecture, we know, is a collaborative profession, a coördination of efforts to create a work of art to fulfill a definite need within a definite cost. The mind of the architect must interpret the need from another mind, apply it to his imagination, translate the concept to other minds, and direct still other hands to give it form and substance and make it fulfill the need for which, and satisfy him for whom, it was created. Nor is this all. We hear a great deal about the delightful collaboration with the other arts, but no one stresses the less delightful collaboration with the countless laws and ordinances and rules and regulations and codes and municipal authorities. It is trite to reiterate these things, but merely to do so proves how inherent an element of architecture is business.

There are still a few architects who can practice architecture in its simplest terms,—and how delightful that is! But a civilization so complicated as ours, so essentially urban in its thoughts, requires for its comfort, if not for its needs, so many material things that a superman could not be expected to have knowledge of them all. Yet the architect must know and coördinate all these material things and bring about a synchronized collaboration of the trades in order that the work of each will be properly incorporated in his conception.

All this collaboration is expensive. Each collaborator must be compensated and derive a profit for his labor, and the architect, too, must live. Mostly there is little left after the architect has paid his collaborators. To create his art the architect must act as architect, engineer, agent, trustee, supervisor, buyer, collaborator, coördinator, executive, and administrator,—obviously he cannot collect a fee for each function, nor does any fee he receives ever seem to be an adequate fee, in the general run of things.

With these myriad responsibilities and duties the architect must conduct a business, no matter how much he desires to suppress that idea. How he conducts it, will be the gauge of his business standing. Generally he gives his time so freely to others that he has little of it left for the intensive study of his own business and its cost. He does not watch his production and other costs with the care that good business demands. He is prodigal of his time and wasteful of his money. Engaged in a business which is notable for its fluctuations and quick upsets in volume, the architect is seldom adequately prepared for reverses and prolonged periods of stagnation. When business is good he must expand and build up an organization; overnight he is compelled to disband it and to economize,—fortunate if he can do this. How often we see the successful architect wearing himself out finding commissions to keep his organization going. He becomes a slave to it,—and finds himself in the anomalous position of working to keep his draftsmen busy and his overhead paid, with nothing left for himself but worry and strain and what fame may come of an artistic success.

Of all professional men, the architect should be most concerned with costs. Usually the architect is more familiar with building costs than he is with the costs of carrying on his profession and creating his art. How many architects know what it really costs them to get to the point where working drawings can be begun or even preliminary sketches made? How many know what working drawings cost, sheet by sheet, job by job? How many know what supervision costs,—supervision adequate to ensure the workmanship and materials to which the owner is entitled? How many know what these costs should really be? With what other costs can they be compared?

As an impractical dreamer, the architect is accepted by the business world; as a business man to whom it would entrust the spending of its money, he has not the entire confidence of that world.

Standardization of architecture is an abomination; standardization of procedure and accounting of the business of architecture is very helpful to success. The Institute has not developed a standard form of accounting whereby an architect may ascertain by actual comparison with other architects what true

costs should be. Architects in the United States, in the aggregate, are receiving fees of not less than $80,000,000 per year. I have not the slightest doubt that more than 10 per cent of that sum is wasted annually by the architect in his own offices through neglect and failure to apply sound business methods.

Orderliness in design is axiomatic with the architect; orderliness in his business and in his time is not so fixed a virtue. The artist points thumbs down on schedules and budgets and anything regular or regulated, yet these things are essential to good business. They are necessary to conserve time; they are imperative if we would not waste our money. Our most limited and most precious asset is time. To conserve it is a duty we owe to ourselves and to our families. Our business day should be organized and every hour of it scheduled. Each day we have things to do. We should list them in the order of their importance, with the most important at the top, and then tackle and do each of them in turn and in that order. We must work against time. We should set aside each day so much time for the drafting room; so much for specifications, for accounting; so much for supervision; so much for conferences and callers; for correspondence; for reading on architecture, construction and the allied arts; and, lastly but most important, for constructive thinking about our business. So far as possible, we should fix positive and regular hours, especially for our conferences, calls and correspondence and our thinking. We should make those hours the same for each day. Regularity and regular hours must be acquired, no matter how monotonous or distasteful it may be to do so. That you can be found in your office each day at the same time for conferences, calls and callers is a sound business asset; it gives you a business standing, and you have created an invaluable credit. Do not let one period overlap the other, nor let callers disturb you except within the hours you have set for conferences. Keep telephones away as well, if you have a tactful secretary. Arrange conferences to fit your schedule of time; you will be surprised how this can be done without losing the commission. Your time may be as valuable as your client's.

I repeat,—conserve your time; schedule your hours exactly. Begin this when you begin your practice, when it seems unimportant to do so. The habit established in the lean years will be worth innumerable dollars when you become busy, and of inestimable value to your health and happiness. You will be surprised how much more quickly your decisions will be given; how much more concentrated will be your thinking; how much more time you have for the amenities of life and for your family, if you have found and use the secret of conserving your time and making it work for you. Above all, do not let anything persuade you to give up the hour of constructive thinking about your business. Take that hour early in the day if you can, when you are fresh. It is the most necessary hour of the day to you! Do nothing but think; if you have no very definite problem, think just the same. Let nothing interrupt you.

Budgeting our time is perhaps the most important thing we can do to ensure our business success. Budgeting our finances is the next most important thing to do. Once you have learned to conserve your time, and have acquired the habit of regulated and regular thinking, the budgeting of your finances will come naturally and inevitably. The budget is the control, and the means of lower costs in producing your drawings and documents. Men work for money and for glory. Money means profits, and profits are the reasons for business. I do not speak of profits in the pure accounting sense. Profits can be ensured only by insisting that cash outgo always shall be less than cash income. Business is conducted at present on a monthly basis; if your total expenditures have been less than your cash income, month by month, your business has made a profit. If there is no profit, you run the risk of financial embarrassment, loss and failure. The budget should control the distribution of all money you receive into your business. If you hold within that budget, it ensures cash profits.

To make your financial budget, you must first know costs. To fix the price which you should charge for your services, you must know costs. To know costs, you must first determine expenses.

The architect should fix a salary for himself, as a fundamental element of expenses. Salaries are for the expenses of daily living; profits for investment and surplus. Salaries should be considered as income; profits may be considered as capital. Salaries should be paid regularly month by month; profits must be deducted in cash from each payment received by the architect before any part of that payment is used for any other purpose. Profits are illusive; if not deducted first, they have a way of disappearing altogether. It is fundamental to set aside profits first. Profits should be banked separately from other funds, as savings. One-half of the profits should be considered as business surplus and be kept in the business and invested in first class securities. One-half may be considered as dividends and invested in securities or real estate or such other forms of investment as may please you. Income derived from the investment of surplus should be added to surplus; income from dividends should be put back into capital, but it may be added to salary.

Costs are direct expenses plus distributed expenses. Expenses are direct when they can be definitely identified as having been incurred solely for any item of costs; they are distributed expenses when they cannot be definitely identified as a proper charge against any single item of costs. An expense should be considered as a distributed expense only when the cost of determining the direct charge would be greater than would be the margin of error if the expense were arbitrarily segregated into parts and each part made a direct charge to the item. Expenses should be distributed monthly. Distributed expense is ordinarily called "overhead."

Costs in the business of architecture fall into five

major divisions: (1) Development Cost, incurred prior to the time when the contract between the owner and architect is executed; (2) Production Cost, incurred to produce the preliminary sketches, working drawings, specifications and contract documents; (3) Supervision Cost, incurred in the field during construction; and (4) Administration Cost, incurred for general office expenses. These four become the cost divisions of the budget. Development Costs, Production Costs and Supervision Costs are always direct charges. Administration Costs are always overhead and are distributed to the other three major cost divisions. Each major cost division may also have its own overhead to be distributed within itself. The fifth major division of the budget is Profits. Profits plus Development Cost, plus Production Cost, plus Supervision Cost, plus Administration Cost, equal total business income. Set up the fifth division first in the budget; deduct it from income. What is left of income are costs. This is fundamental.

The next step is to fix these Costs in money. When that is done, if the costs so fixed prove to be greater than the balance you have left of income after deducting Profits, you can do either of two things,—reduce costs or face a loss of profit. A loss of profit will start you on the way to worry, fear and insolvency; to reduce costs may mean lowering the quality of service you render your client. If you lower the quality of your service, your action will affect the standing of the entire profession, affect your own standing, and clearly indicate that a day of reckoning is in the offing. You cannot do either of these things if you would preserve your business integrity, protect your family and ensure your own happiness and that of others dependent upon you. You may lessen, but not forego, the Profits. Therefore, Profits being fixed, if you cannot reduce major costs without lowering quality of service, it is evident that the income is too small and must be raised.

Unalterably this means that for business success in the profession, costs must be accurately determined and should be locally and nationally comparable, and profits must be stable and maintained. Quite plainly, too, it indicates that our present system of fees is unscientific and fundamentally inaccurate. I believe and hope that there will come a time when the Institute will provide in its Standard Documents, complete bookkeeping and budget forms, which if used by the members, will fix a uniform and standard method of setting up our accounts, determining the costs of service, and afford a means of comparing our costs. Inevitably, this will lead to the discarding of the present fee system of charges and the adoption of a method of charging for services which will be fundamentally and economically sound. I believe this would be a true service which the Institute could render to the profession, and that it would go far to eliminate the enormous economic waste and the inequitable charges for services that now obtain in the profession.

How are these four major costs fixed? An accurate estimate for budget purposes cannot be had except through years of experience. The beginner in the practice of architecture at present has no basic data available to permit him to fix these costs at all accurately. This information should be available to him, in some form. If it were, he could start his business and professional life on an economically sound basis. This would be good for the profession at large. The "infant mortality" in our profession, is unduly large. Perhaps it might be reduced by the right economic start. Budget costs should be built up, item by item, into an aggregate total and not vice versa. The more accurate the items, the less the contingency for failure.

Development Costs vary greatly and cannot be standardized. They should include every item of expense chargeable to a project prior to the signing of the contract with the client. Advertising of every form, dues to business organizations, all such kinds of expenses as the architect would not incur if he did not think it would help his business, should be charged to it. Immediately any development expense is incurred looking toward securing a commission, the tentative project should be set up on the books as an account and given an account number. Development expenses incurred in getting that commission should be charged directly to that account so far as practicable, and it should be charged with its share of the development overhead and its proportion of Administration Costs. If the salary of the architect has been properly apportioned between the Development, Supervision, Production and Administration Costs, the Development Cost will be quite accurately determined. I guarantee that every one of you who does not so keep his accounting will be astounded at the cost of procuring commissions. The Development Costs should be charged each month to the tentative project. When the contract for services is signed, the Development Cost heretofore charged to the tentative commission, becomes a direct charge, to become a part of its final cost; otherwise Development Costs should always be charged off periodically.

I seem to have wandered into accounting, a subject not within the limits of this paper, but one which should be amplified and determined before an accurate budget can be set up.

Production Costs are kept in some form or other by every architect. Usually he figures up his outgo for draftsmen and other tangible items, adds something for overhead, and carries the total as a cost. This can be only approximately right. Production Costs can be closely estimated and fixed for budget purposes. Immediately the contract with the owner is signed, the architect should use his hour of constructive thinking to plan the progress of the work through his office. During that hour and others like it he should plan the drawings to be made and list and give a number to each. He should plan what is to be placed on each drawing. This list of draw-

ings, marked with its estimated number of drafting hours, goes to the drafting room and should not be varied from nor other drawings be made unless they become absolutely essential. Once the sheets are so planned, with the proper cost data at hand, the probable expense of making each sheet can be quite accurately fixed. In no other way can Production Costs be set up with any pretense to accuracy. If this procedure or some other system as accurate is not followed, a budget cannot be set up. To follow this procedure is to set a firm control on drafting, and only thus can drafting room expenses be maintained within the budget estimates. Too much care cannot be exercised by the architect in preparing the Production Costs for the budget.

Supervision Costs are the easiest to estimate. The direct expenses of superintendents, clerks, inspectors, testing, reports, and traveling, are easily determined items. The principal distributed expenses within this major division of cost are the architect's salary and the allocation of the Administration Costs which have been transferred to its Supervision Costs. These are usually estimated too low, principally because the supervision and superintendence furnished by the architect in the usual run of things is woefully inadequate.

Administration Costs are not difficult to determine. All items of Administration Expense are overhead and must be distributed. Therefore they should be kept as few in number as possible. By applying the rule for determining overhead, this is quite easily done, and the distributed charges can be made much smaller in volume than is usually likely to be the case.

Each of the five major items of the budget is thus determined. To go further into their makeup is impossible in this paper, except in one instance. In each of the four major cost divisions, set up a cash reserve. This is the safeguard of your budget. It must be sufficient to cover your errors of judgment in making up the budget, and sufficient to cover the additional expenses which will creep in, in spite of the best made budget. Set aside this cash reserve in each division out of the first income received; if not all, at least its full proportion. I said before, first deduct profits from income,—now I say, deduct cash from the balances in each major cost division and set it aside as a cash reserve in each division. Make this reserve what you think is right, then usually double it. It is better to be right than sorry. Keep these reserves intact as cash to the close of the work so far as you can. Each raid you make on these cash reserves is a barometer of the condition of your costs. If you maintain these reserves intact, your profit is assured. These cash reserves should guarantee money for current operations at all times.

Such is the Architect's Budget,—a budget of his *time* and of his *finances*. In the budget of his time, the hour of constructive thinking is just as important to time as the cash reserve is to finance. Therefore, I repeat, budget your time, budget your finances, set aside your hour of thinking, your profits, your cash reserves. They form a guarantee of your success.

Rendering by Schell Lewis

Perspective of House Designed Within Definite Cost Limits
Lyon & Taylor, Architects

DEVELOPING SKETCH PLANS FOR SMALL HOUSES TO MEET BUDGET REQUIREMENTS

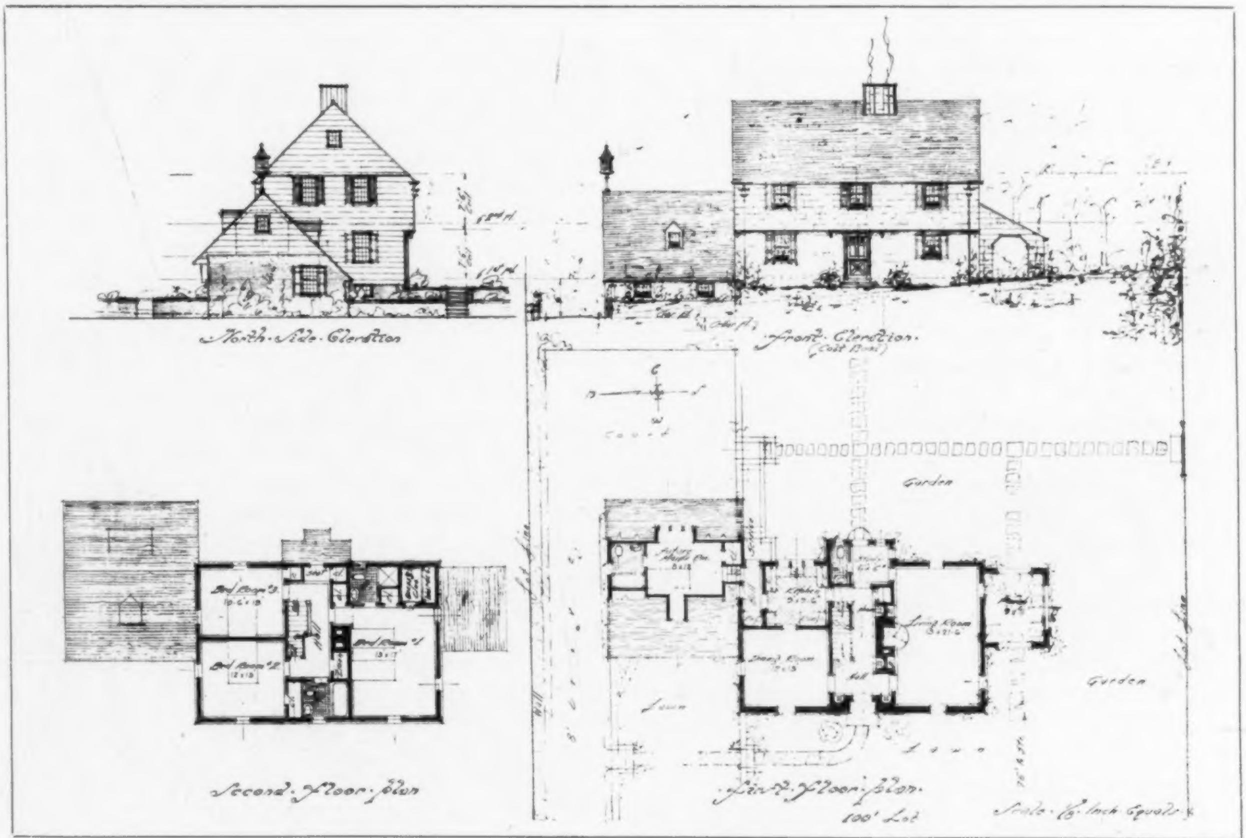
BY

C. STANLEY TAYLOR

PROBABLY the most difficult problem encountered in normal architectural practice is the development of plans for small houses which can be successfully built within predetermined cost limits. The average client seeking a small house usually has very limited funds available for his purpose and usually has ideals all out of line with his budget limitations. To reconcile the owner's conception of room sizes, plan and arrangements and general architectural design to a rigidly restricted cost limit is the familiar and unwelcomed task of every architect engaged in the domestic architectural field. No matter how far apart the client's tastes and the size of his pocketbook may be, it is distinctly the architect's responsibility to help him secure a house that will meet his needs without plunging him into serious financial difficulties.

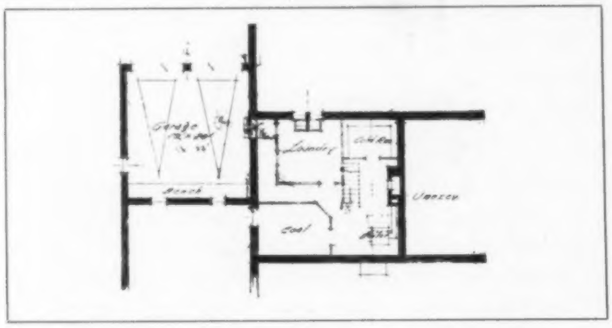
Frequently an architect is commissioned to design a small house without any definite cost limit being established by the owner, beyond an admonitory warning that he does not want to spend too much for his home. The owner's main thoughts are centered around matters of style, room sizes and arrangement, and little conveniences he hopes to incorporate in the plans. The owner's wife has dreamed of this new home; her thoughts are mostly of color schemes, architectural features and very practical housekeeping equipment. Costs are in the background until the architect, having faithfully developed sketches which seem to meet his client's wishes, is asked what the house will cost. Then trouble usually starts; the architect is often accused of extravagance or of ignorance of costs; eventually the sketches must be redrawn on a totally new basis with less confidence and good will on both sides, and at a loss to the architect of the good talent and time wasted. The better method is to discuss costs at once and to fully acquaint the owner with the nature of the problem he presents and with whatever necessity there may be for making some concessions in his space requirements or in his cost limits before sketches are undertaken. A frank and complete discussion of this troublesome matter, even before the architect is actually commissioned for the work, is far more advantageous to the owner and architect alike than its neglect until after the client is committed to a program beyond his means, or before the owner's ideas are so fixed with respect to the type of house he desires that he often makes an unwise investment.

The architect who follows this better course soon



Sketch Plans Made to Meet a Definite Budget

R. C. Hunter & Bro., Architects



Cellar Plan of House Shown on Page 137

acquires a reputation for integrity and skill which ultimately will carry him farther in this field than the architect who permits his client to overlook his actual financial limitations for the sake of procuring a house that pleases his fancy without respect to its cost. The architect who completes any project after a long series of struggles and arguments with his client is seldom recommended to others in a like position. He earns a reputation for being an extravagent designer, no matter how much care he has exercised to keep the costs fairly close to the owner's ideas. Even a 5 or 10 per cent overrun may result in serious dissatisfaction on the part of a client who has established at the beginning of the undertaking his actual financial limitations, whether or not the architect is aware of his maximum allowance. A 5 per cent saving within the owner's original budget, on the other hand, will usually leave a lasting favorable impression with the client and will lead him to frequent commendation of the architect's talents and good judgment, and earn for the latter a prestige which may become the foundation for an extensive and steady practice.

Of course, it may be argued that the small house field is never profitable; that it is one which architects enter only as a means of establishing themselves in business; and that a reputation for economical building in this field merely leads to more commissions of this unprofitable type without opening up fields of larger endeavor. It is undoubtedly true that small house architecture for the standard minimum fee is actually burdensome to the architect. A higher fee must be charged in order to pay the cost of well developed plans and adequate supervision. When the fee is made commensurate with the labors involved, domestic architecture in the lower price ranges may pay an adequate income. There are many successful architects whose reputation has been developed entirely around their excellent work in designing small houses. Their practice has grown from this prestige into larger fields, and they have profited in all branches of this practice. Their success has invariably been built upon excellence of design plus intelligent handling of costs.

Aside from the ethics of the situation and the architect's moral obligation to render a complete and intelligent service to his clients who must build within limited budgets, the problem so frequently arises in ordinary practice that some definite means of meeting the situation must be devised. In spite of controversies over the value of cubic foot costs as a guide in estimating the costs of new buildings, no substitute has yet been found that better equips the architect to control the development of his sketch plans within predetermined cost limits. In the New York district, which is probably the highest priced area in the country for home building, many offices have found that they never exceed 60 cents per cubic foot for quality development of small houses embodying sound construction systems and high grade materials in all details. Other offices frequently build within a 50-cent limit, and occasionally some of the very best designers succeed in designing houses that actualy cost from 40 to 45 cents. The difference of a few cents per cubic foot even in a small house rapidly mounts into dollars; nevertheless, the experienced architect soon acquires a definite knowledge of his limitations and can quickly judge the approximate cubic foot cost of a dwelling after outlining its general style and equipment features.

Th first step, therefore, is to translate the owner's idea of space into a probable gross volume for the completed building. It has been established by a number of careful checks that approximately one-half of the gross volume is actually available in the net space devoted to living purposes. Using this as the first guide, therefore, the client may be requested to give the number of rooms he desires and the approximate size of each, together with the ceiling heights for the typical floors. By adding a reasonable amount for closets, hallways and bathrooms, but disregarding basement and attic space and space loss due to the thickness of walls and floors, a net volume of living space may be quickly estimated. Doubling this total would give very quickly the approximate gross cubage of the structure before any plans are attempted. At once the architect is in a position to tell his client that those space requirements will probably come within or will undoubtedly exceed his budget limitations, for the total cost can be checked by multiplying the gross volume by various prices ranging from 40 to 60 cents per cubic foot as the architect may deem suitable for the type of construction and the prevailing local costs. At once the question of reconciling space and cost is presented to the client. A general explanation usually is sufficient to convince the client of the absolute necessity for some adjustment in his requirements. Obviously, the architect who has made no sketches cannot be accused of designing more expensively than some competitors. When the owner realizes that the estimates are based on various cubic foot cost figures, he realizes at once the necessity for modifying his ideas as to quality of finish and equipment and for making concessions in room sizes, arrangements and the general architectural style. This establishes a frame of mind which leads to a satis-

Rendering by E. A. Bennett

Perspective of Country House Designed to Meet Budget Requirements
Lyon & Taylor, Architects

factory and open discussion of costs throughout the project. No troublesome details enter into the problem at this stage. The whole picture is viewed broadly, and the architect is usually permitted at once to either increase the budget limitations or to prepare sketch plans which will definitely fall within a predetermined cost regardless of the room sizes necessary to achieve this end. If a hopeless situation is encountered, the client may be lost for the moment, but the architect has wasted no time, and in the long run has made a friend who is more than likely to come back when his financial situation is improved or is almost certain to recommend the architect to others; this is far better for the client than if he foolishly undertakes the construction of a house under the guidance of a less ethical designer and pays the severe penalty of considerably exceeding his budget limitations.

At this stage the architect can usually also introduce a discussion of financing methods and may frequently enable an owner to find means of borrowing funds, permitting him to have the house he desires without requiring an initial investment beyond his means and without unduly burdening himself with financing and carrying charges. A sound knowledge of the mortgage market is invaluable to the architect engaged in this work. Assuming that the first discussion has resulted in an approximate agreement as to the size and cost of the finished structure and that the architect has been engaged to prepare sketch plans, he is then committed to a program of carrying out his design work on a basis that will insure his client of a reasonable margin of safety when contract figures are ultimately secured. Again cubic foot cost figures are used as the guide, and the margin of safety is secured by adopting in the early stages a unit which is large enough to permit considerable variation in final details. If the architect is accustomed to building for 50 cents per cubic foot, it is best to compute the maximum volume that can be built within the established budget on a basis of from 53 to 55 cents per cubic foot. The gross volume thus established is then translated in the sketch plans by converting volume to square foot floor areas and using these as a guide for the general dimensions of the floor plan.

Reconciling these volume and area limitations to the development of a successful and workable plan requires the exercise of a great deal of ingenuity and skill. Usually in small house architecture the space problem compells relatively low cost construction in addition to the efficient use of every square inch of floor area. Low cost construction in turn calls for simplicity in plan arrangement and for the adoption of an architectural style which may be consistently followed using low cost materials and stock designs for windows, doors and both exterior and interior trim. It involves the use of carefully planned systems of mechanical equipment, including the concentration of plumbing lines, the careful distribution of radiators, and the selection of an efficient and inexpensive heating plant as well as the careful placement of electrical outlets. A thorough knowledge of building materials is an essential part of the architect's equipment; and equally thorough knowledge of practical construction methods is valuable in preparing drawings and specifications that will permit economical construction without sacrificing quality and

durability. Fortunately, the architect who is a close student of small house design and construction is finding himself constantly assisted in his efforts to provide maximum volume within reasonable cost limits through the introduction of new materials and construction methods. The building field is rapidly being enriched with new products which save space, make possible more rapid construction, or which actually cost less than the usual materials, the use of which has prevailed through custom for many years. Insulating products are being introduced which combine the functions of sheathing and a plaster base in one material. Thin partitions are being developed permitting plastering on both sides of the partition core composed of a single structural material. New composition flooring materials are showing economy over the more expensive tiles for bathrooms and kitchens, and some of these are even taking the place of higher grades of hardwood flooring; stock patterns of windows, doors and standard trim are being so vastly improved in design as to find ready acceptance by architects in place of specially detailed items which not only contribute to the cost of the structure but add to the architect's burden in preparing the drawings and supervising their construction and installation. Marked improvements are being made in heating systems; and quality plumbing fixtures are available which contribute to space saving and to economical installation. The importance of keeping closely in touch with introduction of new materials and new developments cannot be over-estimated for the architect who is to succeed in the small house field.

Unfortunately, the greatest aid in planning small houses within limited budget requirements must be developed by the architect for himself through experience. Cubic foot cost figures are not available through any medium of exchange on a basis which makes them reliable and useful to those not fully familiar with all the circumstances surrounding the particular building upon which they were developed. Undoubtedly the time will come when a standard system of maintaining cubic foot costs will come into general use. This system will not only report the cost based upon a uniform method of computing volume, but will require that the figures be accompanied by a detailed outline of the features of the building and of the construction materials employed, so that others may properly interpret the figure when applying it to other structures of similar or varied nature. For the present, the architect can rely only upon figures developed in his own practice. The adoption and maintenance of a uniform system for figuring cubic foot costs from completed buildings will soon provide the office with data of constantly increasing value.

The basic requirements for a cubic foot cost record system, proved by experience approximately correct, are:

(a) The volume of each building must be computed on a uniform basis. A standard system for figuring volume should provide for a quick method of measuring the volume of footings and foundations and a standard method of adjusting the volume of open porches and minor structures. Footings are usually figured by taking the basement area and multiplying it by 1 foot of depth below the finished basement floor. Open porches are usually figured at from one-third to one-half of their volume if outside the main walls of the building and at their full volume if within the main walls. Bay windows, dormers and other minor architectural features are figured at their full volume in careful computations or are neglected when they do not exceed 3 or 4 per cent of the total volume of the structure. A standard system on this point should be established.

(b) A uniform basis for computing cost is of vital importance. The cost normally should include builder's fee or profit and represent the total cost of construction including all subcontracts, but should be exclusive of architect's fee and of items not directly pertaining to the cost of the building itself, such as grading, planting, driveways, walks and detached garages. If possible, cubic foot cost should invariably be figured on the basis of actual contracts awarded, so as to eliminate the confusion developing through extra costs chargeable to changes made by the owner during the construction period or to unforeseen contingencies which might arise through encountering rock in the foundation work or through delays due to strikes or other extraordinary causes.

(c) The figure given should be accompanied by the date upon which the general contract was awarded, for this usually indicates the prices at which materials and labor are purchased. In a fluctuating market a variation in the date of six months might make a difference of several per cent in a building's cost. Location is of equal importance, unless the architect's practice is entirely confined to a restricted area.

(d) The record should contain a brief description of these major points: total volume; total cost; approximate area of ground floor plan (and if possible the actual size of the ground floor to indicate the approximate perimeter); general style of architecture; construction of exterior walls; mechanical equipment; total number of rooms and baths; and finally, the record should contain a statement as to whether the general quality of construction was (a) low cost, (b) moderate or average cost, or (c) extra quality. Every one of these details is important.

The consistent maintenance of a system of records of this type by many architects engaged in this field would form a basis for a most invaluable exchange of data through the architectural press. Eventually, such an exchange will be accomplished, and when this occurs architects will be able to estimate with increasing accuracy the cost of buildings from their sketch plans and will render improved service to their clients through eliminating the grave danger of exceeding budget limitations, with all the difficulties involved.

MECHANICS' LIENS

BY

CLINTON H. BLAKE, JR.

THE mechanics' lien is an American invention. Formerly in England and in this country there prevailed, and still prevails in England, what is known as the "common law." This is nothing more or less than the law of precedent built up not by statute and the enactment of laws but by the decisions of the courts. When, for example, in the early days of English law, one person trespassed upon another's land, the latter applied to the courts for damages, and the courts, considering the general common sense of the case, declared that the person trespassing must pay damage to the man upon whose land he came, on the theory that the land owner was entitled to the enjoyment of his land without being compelled to allow others to use it. When a similar case next arose, the court followed the precedent thus set down in the previous decision, and so in time this rule of law as to trespass became established. The same course was applied to all other legal questions which arose, and the law was laid down by these precedents, and the law which they established became known as the "common law." In America the common law was originally in force and is still in force in various jurisdictions. Gradually, however, we departed from observance of the common law custom and built up a body of statutory law. The tendency today, as every student of legislation knows, is to cure everything possible by legislation, and an appalling number of statutes are being constantly enacted, accordingly.

One of the fruits of this statutory development was the "mechanics' lien" legislation. Its inception dates back to 1803, when the first mechanics' lien law, apparently, was adopted by the state of Pennsylvania. For some time the mechanics' lien statutes were directed solely to the protection of mechanics and had none of the broader provisions for the protection of workmen, subcontractors and materialmen which now generally characterize them. Gradually the idea of protecting by lien all those who had contributed materially to the enhancement of the real property value involved gained in favor and was adopted generally by the different states. Gradually, also, the scope and extent of the relief afforded by lien laws have been extended, and at practically every legislative session new bills are introduced, the purpose of which is materially to increase the liberality of the lien laws and to extend their benefits to those not heretofore covered by them.

The old idea that the lien statutes were for the protection of the simon pure mechanic only has been almost universally done away with, and the state legislatures are steadily broadening the scope of lien legislation, so as to bring within its benefits practically all those who have, by their labor, contributed to the enhancement of the value or improvement of the real property involved. At the same time it must be understood always that the mechanics' lien is fundamentally a claim against the property, rather than a claim against the owner of the property personally. The theory upon which all of the lien statutes, substantially without exception, proceed is that the property of the owner has been enhanced in value by the labor of those claiming the liens and that therefore it is equitable and proper that the property should be subjected to a lien for the amounts due them.

Owner's Liability. Radical as this legislation is in one sense, it has nevertheless in its development recognized that it would be unfair to expose the owner to a lien claim without strict limitations as to amount and liability. In the better jurisdictions, two main limitations will be found. In the first place, the lien must be predicated upon the consent of the owner, express or implied, that the work be done; in the second place, ordinarily, the total amount recoverable on lien claims will not be allowed to exceed the total unpaid balance due to the contractor at the time the liens are filed. The reasonableness of each of these limitations is obvious. If a lien could be established for work done without the consent of the owner, it would be possible for claimants to do work on his property which he has not wished to have done and then subject the property to a lien for the value of the work. If, also, it were possible to hold the property for all sums due without regard to the unpaid balance of the contract price, the owner would be repeatedly placed in a position where, having paid to the general contractor or other contractors substantially the full value of the improvement made, he finds that his property is subject to liens for a large proportion of the total cost, due to the failure of the contractors to take care of their subcontractors or materialmen.

The provisions of the New York lien law and the decisions of the New York courts on this point are typical of the sounder point of view. The lien law in this connection provides that:

"If labor is performed for, or materials furnished to, a contractor or subcontractor for an improvement, the lien shall not be for a sum greater than the sum earned and unpaid on the contract at the time of filing the notice of lien, and any sum subsequently earned thereon. In no case shall the owner be liable to pay by reason of all liens created pursuant to this article a sum greater than the value or agreed price of the labor and materials remaining unpaid, at the time of filing notices of such liens, except as hereinafter provided."

The New York Court of Appeals, in considering this same point, has decided that:

"The settled construction of the Lien Law is that,

except in case of fraud, the owner cannot, under any of its provisions, be compelled to pay any greater sum for the completion of a building than by his contract he has agreed to pay. The effect of the statute is simply to take from the owner money actually owing by him on his contract and to apply it in payment for the labor and materials which subcontractors or materialmen have contributed toward the performance of the same contract."

In other words, the mechanics' lien, under this rule, attaches primarily to whatever sum, if any, at the time the lien is filed may be due to the contractor. In many of the states, the lien of the subcontractor is based upon the legal theory of "equitable subrogation." This, translated into plain English, means merely that by the lien there is transferred to the lienor the claim of the contractor against the owner up to the amount of the balance then due or which may become due thereon.

Owner's Consent. With regard to the consent of the owner upon which the lien, as already noted, must under the usual rule be predicated, there is a wide divergence in the provisions of the various lien statutes. The principle is generally recognized as sound, but the states differ materially in the degree of consent or approval which their legislatures and courts interpret as sufficient to bind the owner. It has been stated broadly that some contract to which the owner is a party and which covers the work for which the lien is claimed is a necessary prerequisite to the validity of the lien. This does not mean, however, that to sustain the lien, there must be a written contract signed by the owner covering the work and embellished with legal acknowledgments and seals. The contract may be formal or it may be informal. The consent of the owner may be expressed most definitely in writing, or it may in some cases be implied. There must, however, as a general rule, be some understanding on the basis of which, whether it be by express agreement or by implication, the courts can say that the owner has approved, adopted or ordered the work. It will be in every case a question of fact dependent upon the peculiar facts of that case.

In the limited space here available, it is impossible to discuss in detail the variations between the different state statutes, and the legal interpretations by the varying states of facts which are held to constitute an agreement by the owner that the work be done. It may be stated broadly, however, that the tendency has been and is to be increasingly liberal in the interpretation of what constitutes a contract by the owner sufficient to sustain a lien. Some statutes require that such a contract shall be in writing. More and more, however, the states are recognizing the right of the lienor to sustain his lien in the absence of a written contract. Where this right is recognized, the courts or statutes proceed upon the assumption that the owner might contract for the work or approve it by implication just as surely as if he had made a formal contract. If it can be shown that the owner has consented that the work be done and has allowed it to be proceeded with, without objection and with his approval, this conduct on his part in many of the states is construed as an agreement by him that the work be done. Even in the jurisdictions which have most clearly recognized an implied consent by the owner as sufficient to sustain the lien, the lienor cannot safely predicate his lien upon the mere fact that the owner knew that improvements were being made and did not object to them. In some cases this might be sufficient to subject the property to the lien, and in some it might well be insufficient. For example, in New York it has been held that the mere general consent of the owner that a lessee in possession of the premises may at his expense make alterations and repairs, does not constitute within the meaning of the New York statute that "consent" by the owner which is necessary to sustain a lien; and that the fact that the owner knows that the work is going forward and even expresses satisfaction with the progress made and the work done does not subject the property to a lien, where he is in the position of a landlord and has no control or supervision over the performance of the contract. On the other hand, it has been held by the New York courts that a lien can be sustained in a case where a tenant has ordered work done and the plans for the work have been submitted to and approved by the owner.

This whole question of consent by the owner is difficult and somewhat technical. Where the work is done at the order of the owner himself, there can be no question. Where, however, the work is done without such an order but by the order of a tenant, the validity of the lien will depend in most states, and certainly in New York, upon the ability of the one asserting it to establish with reasonable clarity the fact that the owner knew of the work, that he approved it and consented to its being done, and that his course was such as to amount to an implied agreement on his part that it should be done.

The Court of Appeals of New York, on this question of consent, has thus stated the requirements:

"While it is doubtless true that the consent required by the Lien Law need not be expressly given, but may be implied from the conduct and attitude of the owner with respect to the improvements, which are in process of construction upon his premises; still the facts from which the inference of a consent is to be drawn, must be such as to indicate at least a willingness on the part of the owner to have the improvements made, or an acquiescence in the means adopted for that purpose, with knowledge of the object for which they are employed."

* * * *

"We may, therefore, fairly deduce from the decisions of this court upon the question now under consideration these various propositions: (1) That

no express consent is necessary on the part of the owner in order to bring the case within the statute providing for mechanics' liens. (2) That a consent may be implied from the conduct and attitude of the owner with respect to the improvements which are in process of construction upon his premises. (3) The facts from which the inference of consent is to be drawn must be such as to indicate at least a willingness on the part of the owner to have the improvements made or an acquiescence in the means adopted for that purpose, with knowledge of the object for which they are employed. (4) The omission of the owner to object to improvements made upon his premises by a tenant, when he has knowledge of the circumstances under which they are being made, is always an important fact bearing upon this question."

On the other hand, the same court has laid down the rule that, in order to establish under the statute a consent by the owner, it must be shown that his consent has been an "affirmative affirmation" in procuring the making of the improvement or that the owner had possession and control of the premises affected by the improvement and consented to it in the expectation that he would reap the benefit of it. The fact that the owner actually receives the benefit will go far to establish the fact that he has approved the work in the expectation that he will receive this benefit. If, being informed of the intended improvement and knowing that the work is being carried on, he stands by and allows it to go forward and receives the benefit of it, his consent will ordinarily be implied and the lien sustained. On the other hand, it has been held that it is not necessary that he should actually eject the contractor as a trespasser to escape lien liability, and that, if he forbids the performance of the work, his consent will not be implied, because he has not taken ejectment proceedings or physically removed the contractor from the property.

Performance of Contract. Assuming that the necessary contract by the owner or approval and consent by the owner have been established, it is necessary that the lienor establish a number of other fundamental points to sustain the lien. The lienor must prove in the first place that he has performed his contract, or that the owner has prevented his performing it or waived any failure to perform which there may have been. Performance in this connection does not mean performance to the point of perfection. The courts here invoke the rule of "substantial performance." If the work has been substantially completed in all essential particulars, the lien will be allowed and will not be defeated because some minor defects or omissions are apparent. If a few fixtures, for example, have been omitted, the value of which can easily be determined and is relatively small, the contractor will be granted his lien for the full amount less a reasonable allowance for making good the existing omissions. In the second place, the lien must be filed within the time limited by law, which time, of course, will depend upon the statute applicable in each state and will vary in accordance with the differing state laws.

Approval of Work. Where other conditions are present, as for example, where the approval of the architect is a condition precedent to recovery by the contractor or where, in the case of a municipal lien, a departmental approval or certificate is required, the contractor must produce the required approvals or certificates before he can sustain his lien. In a word, he must, in order to sustain it, produce the same proof which the courts would require him to produce in establishing the indebtedness of the owner in a suit by the contractor against him under the contract, if no lien had been filed. The lien is merely an additional remedy in the nature of security and does not give to the contractor the right to recover, in the absence of proper legal proof and evidence that the work has been done and that the value of the work is the amount which he claims.

Probably the greatest variation between our state lien laws is to be found in those provisions of the laws which have to do with the liens of subcontractors and materialmen. In some states they are granted direct liens by statute. In other states their liens are on the basis of "subrogation," which I have already mentioned. Where this doctrine is in effect, the subcontractor or materialman, to establish his lien, must show that the contractor with whom he dealt was himself entitled to a lien, and that there still remains due some unpaid balance from the owner to the contractor which can be applied to the satisfaction of the lien.

When we come to the subcontractors or materialmen of a subcontractor, we are naturally getting still farther removed from the primary obligation between the owner and the original contractor. For many years, those with whom the subcontractor dealt were considered too far removed from the building operation to be accorded any lien rights. The liberalizing process which we have noted, however, has in large measure removed this bar, and today those performing labor or furnishing materials to the subcontractor may now generally successfully avail themselves of lien protection.

Limitations Imposed. State legislatures have generally recognized, however, the danger of throwing open too widely the lien door to the entire line of subcontractors and materialmen and have, in the wording of the lien statutes, set up safeguards and limitations which must be observed, if the lien is to be sustainable. In some cases it is provided that the contract must be recorded. The recording of it may be essential to the lien of the contractor himself, or to the lien of the materialmen or subcontractors, according to the particular statute involved. In New Jersey, if the contract and specifications are filed in the office of the county clerk of the county in which the work is being done and before the work is commenced, the liability of the owner will be limited to the contractor, and the subcon-

tractors and materialmen will be precluded from enforcing mechanics' liens. It is important that this provision be held in mind by architects practicing in New Jersey and that they advise owners before the work is commenced to file the contracts and specifications, so as to secure this protection. There has been some question under the New Jersey decisions with respect to the effect of filing the contract after the work has been commenced. Under the more recent decisions, the only safe course to follow is to have the papers filed before any work whatever has been done. Otherwise, even if the filing takes place after an insignificant portion of the work has been done and before the work on which the lien is claimed has been commenced, the owner may not be able to set up the filing as a bar to the lien claim. For example, if the excavation for the cellar has been started before the filing date, a carpenter whose work has not been commenced until after the filing has taken place may nevertheless, it seems, assert a lien and plead that the filing of the contract and specifications is ineffectual because it did not take place before the commencement of the work.

Architect's Lien Rights. The liberal tendency which has been responsible for broadening the scope of the lien laws so as to take in subcontractors and materialmen and the others whose work has contributed to the improvement of the property involved, has been responsible also for extending the protection of the lien laws to architects. Under the earlier laws, the architect had no lien rights. As the laws developed, it was held that, to the extent of the value of services performed by him in the nature of supervision, he might maintain a lien. Gradually this right in many of the states has been extended and amplified. The next step was to grant to the architect a lien for the full amount of his services, including the preparation of the plans and specifications, provided he had supervised the work. Having reached this point, it was entirely logical and equitable that the statutes should be so amended and interpreted as to give to him a right to file a lien, whether he had supervised the work or not, provided that the work performed by him had benefited the property and been used in connection with its improvement.

This rule has been definitely established in New York state. Under the present lien law in that state, the architect may file his lien for the agreed or reasonable value of his services in preparing the plans or specifications, even if he has not been called upon to supervise the work. Of course, if his contract has required him to supervise the work and his failure to do so has been due to a breach of the contract on his part, a different question is presented. To establish his lien, he must show that he has performed his contract and, if he has breached it, naturally his right to the lien will fail in consequence. The next logical step will doubtless be a provision which will give to the architect a lien for the preparation of plans and specifications for the improvement of real property, even if the work is not proceeded with. In fact, efforts have already been made in New York to amend the lien law to this end. There is much to be said for the suggestion. The architect who has, at the request of an owner, prepared plans and specifications, has certainly done work for the improvement of the real property. If the owner elects not to use the plans and specifications, it may well be urged that he should not, by the mere failure to use them, be able to deprive the architect of his lien right. In order to assert this right, the architect should, however, be compelled to show, in all fairness, that the plans and specifications as prepared are such as were ordered by the owner and then they are in proper form. Doubtless the argument which has prevented this final extension of the law with respect to architects is that to so amend the statute would open the door in some cases to unjust claims and encourage the preparation of plans without proper authority, for the purpose of forcing an owner to make payment for them under threat of having his property encumbered by a lien. There is something to be said for this point of view. On the other hand, the lien on the property can always be removed on the filing of a bond. Where this is done, the bond takes the place of the real estate as security, and the matter can then be thrashed out in court and the property left free from the lien.

Probably the chief reason that the architect has not been given the right to assert a lien where the building has not been proceeded with arises from a failure of the state legislature to properly appreciate the difference between the character of the services rendered by the architect and the services rendered by the ordinary contractor or materialman. Obviously, a contractor or materialmen cannot be a party to the improvement of real property, unless the project is actually undertaken. If the work is not started, he is not called upon to perform labor or furnish materials. With the architect it is different. If he has agreed to prepare plans and specifications and does propare them, he has immediately made available to the owner material which can be used for the improvement of the property. He has, in fact, performed labor for the improvement of the property and improved it in the sense

that he has laid out the scheme for the work of improvement and the specifications under which it is to be carried forward. Under a statute which gives a lien for work done "for the improvement of real property," as distinguished from work done "in the actual improvement of" real property, services of this character might well, and logically, be made the basis of a lien. It is a question of time only, I think, before this result will be secured, in some jurisdictions at least.

Jurisdictional Difficulties. It must be borne in mind at all times that the lien statutes vary materially according to the jurisdiction in which they are in force. No lienor can safely file a lien in one state on the basis of the requirements of another state. There is as much difference between the lien laws of the various states as there is between the divorce laws of the various states. While many of the considerations which have led to the agitation for a uniform divorce law do not, of course, apply to lien legislation, there is much to be said in behalf of the proponents of a uniform lien law. Increasingly, under modern industrial conditions, contractors and materialmen and architects, also, are being called upon to perform services in states other than the states in which their offices and chief activities are centered. If a uniform law could be made available, it would greatly simplify lien procedure.

In this connection, the Department of Commerce, through "The Standard State Mechanics' Lien Act Committee" has been active. It has just issued, as I write, a second tentative draft of a proposed uniform mechanics' lien act, and submitted it for general consideration and comment. The Act as submitted is well worth the reading of every architect, and shows clearly the careful consideration which the Committee has been giving to this subject. Special consideration has been given to the problem of how best to secure the protection of the owner against liens and at the same time fairly recognize the rights of the contractor and materialman. Various remedies have been suggested and, as is natural, some have tended to make the owner a collection agency for subcontractors and materialmen, and others, on the contrary, to set up too stringent provisions for his protection. Much good, will, I am sure, result from the work of this Committee and, if, with the coöperation of bodies such as the American Institute of Architects and associations of contractors, it should bring about a uniform law so drawn as to be liberal and yet not over-radical, the result would do much to simplify a somewhat confused situation. Certainly it would bring about a far more accurate understanding of lien legislation and of the respective rights of the owner, contractor, materialman and architect in connection with it.

The Architect's Interests. Pending the dawn of the millennium in this respect, the practicing architect will do well to acquaint himself generally with the provisions of the lien laws applicable in the jurisdiction in which his practice is carried on. He should do this both in his own interest and in the interests of his clients. He may wish to avail himself of the protection of the law, and in every project of any size he will be called upon to consider his client's protection in any event. The more thoroughly he understands the provisions of the lien law, the more competent he will be to advise his client and to protect the latter's rights and interests. It may perhaps be true that his legal duty in this connection will be accomplished if he suggests to his client that the latter should have his attorney advise him in connection with any lien considerations and the steps to be taken under the contract for his protection against liens. On the other hand, the architect whose conception of his duty is somewhat broader and who goes out of his way to advise his client and to protect him from lien complications, will build up, as a result, good will and confidence on the part of his clients, the benefits of which cannot easily be over-estimated.

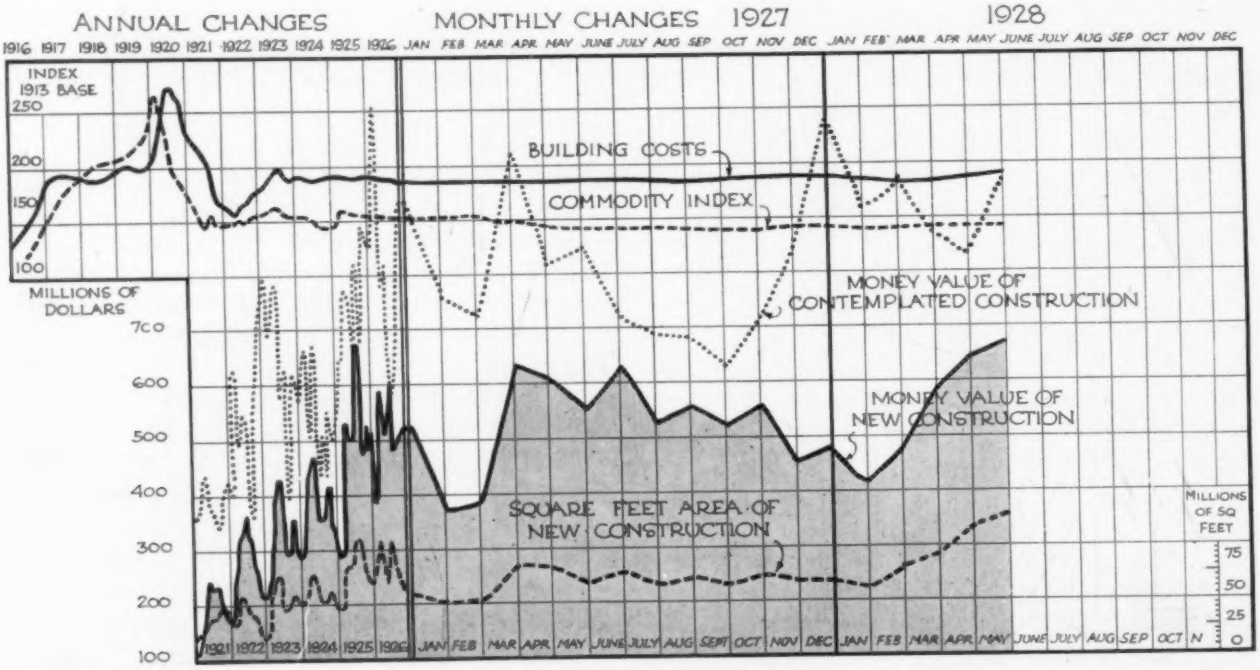
In any event, the architect should see to it, in drafting the contract and specifications and in advising with respect to them, that the owner is protected by the insertion of proper provisions for the withholding of the final payment and for the submission by the contractor, with his requisitions, of statements and receipts showing the payments made to subcontractors and materialmen. If the architect certifies payments without these precautions and allows the owner, on the basis of these certifications, to pay out monies to the contractor when the contractor has not in turn properly taken care of his subcontractors or materialmen, he may well be held to account by the owner for negligence. The only safe course for him to follow is to exercise special care throughout the operation in checking the outstanding claims of subcontractors and materialmen and in being entirely satisfied with respect to the condition of their accounts, before issuing certificates. The architect is in a position to protect the owner in this connection. This protection he should be diligent in giving, as a fulfillment of the obligation which he owes and as a matter of ordinary good business in his own interests for it is to his own interests to have a good reputation.

THE BUILDING SITUATION

A MONTHLY REVIEW OF COSTS AND CONDITIONS

FOR two consecutive months all construction records in the 37 states east of the Rocky Mountains have been broken, according to reports of the F. W. Dodge Corporation. In April, building and engineering work contracted for in these states (representing about 90 per cent of the total country) amounted to $643,137,100. In May the total was $668,097,200. Only six times prior to April have the month's totals exceeded $600,000,000, these being in August, 1925, March and August, 1926, and March, April and June, 1927. Similarly, the totals for the year to both April and May constituted new records. In April the total for the first four months of the year was $2,128,204,100, which exceeded the values for the similar period to 1927 by 6 per cent. In May the year's total rose to $2,796,301,300, which is 9 per cent over the first five months in 1927 and 7 per cent over the same period in 1926.

In April three sections of the country saw records broken; the New England States, where the value of construction for the month was 9 per cent over last year and 10 per cent over last month; the Middle Atlantic States, where two large contracts totaling $27,500,000 were largely responsible for an increase of 40 per cent over April, 1927, and 47 per cent over March, 1928; and the Central Western States where April totals for this year were 13 per cent over April, 1927, and 7 per cent over last month. In May four districts broke all former records for the month. New York state and northern New Jersey showed a 22 per cent gain over the preceding month and a 33 per cent increase over the same month last year. The expenditure of $184,555,000 in contracts made this also the highest monthly total since December, 1926. The New England States continued to show unusual activity, with a May total of $60,229,800, which is the record monthly total for the district, and which represented an increase of 30 per cent over April, 1928, and of 45 per cent over May, 1927. The Middle Atlantic States also established a new record for May with $76,937,300 worth of contracts, which was 38 per cent ahead of May, 1927, but was 25 per cent under the total for last month, for reasons already indicated. In the Central Western States the total, $192,868,300, was a 27 per cent increase over May, 1927, and 3 per cent ahead of April, 1928. For the 37 eastern states, analysis of the month's totals shows that 43 per cent of all contracts in April and May were for residential construction. Increased activity in public works, industrial and commercial buildings is indicated in these interesting figures.



THESE various important factors of change in the building situation are recorded in the chart given here: (1) *Building Costs.* This includes the cost of labor and materials; the index point is a composite of all available reports in basic materials and labor costs under national averages. (2) *Commodity Index.* Index figure determined by the United States Department of Labor. (3) *Money Value of Contemplated Construction.* Value of building for which plans have been filed based on reports of the United States Chamber of Commerce, F. W. Dodge Corp., and *Engineering News-Record.* (4) *Money Value of New Construction.* Total valuation of all contracts actually let. The dollar scale is at the left of the chart in millions. (5) *Square Foot Area of New Construction.* The measured volume of new buildings. The square foot measure is at the right of the chart. The variation of distances between the value and volume lines represents a square foot cost, which is determined, first by the trend of building costs, and second, by the quality of construction.

COSTS AND SPECIFICATIONS

BY

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THE silence which settled over the little group of tourists in a corner of an ancient and lovely cathedral was shattered by the exclamation: "I wonder how much the damned thing cost"! So are many of our dreams shattered when measured by the modern standard of value,—money!

The only way in which the architect's ideas can find tangible and concrete expression is by means of drawings and the written word in the form of specifications. Drawings are limited almost entirely to their function of illustrating the design and dimensions of each individual portion of the work. The specifications are capable of expressing accurately the multitude of conditions which require consideration to carry out the architect's ideas in conformity with modern methods of transacting business. An essential qualification of a specification writer is the ability to obtain the best possible value for the money available. In this respect he bears a striking resemblance to the purchasing agent, and like him should be thoroughly familiar with the market conditions affecting building materials. The specification writer should also be an expert on the qualities and grades of the multitude of materials which enter into the construction of a building. The selection of the proper material for a given purpose is the result of years of experience and the proper contacts with authorities on the various phases of building construction.

A specification which has been loosely compiled and which contains meaningless paragraphs will add to the cost of the building, for the reason that it will create a condition where the owner will pay for many things which he will not receive. Under these conditions, an experienced contractor will estimate to cover himself from loss, no matter what the architect's future interpretation will be. When a specification is carelessly compiled and indicates that the architect is ignorant of the proper administration of a building project, the contractor will often feel that he can "crash the gate," and again the owner will pay for many things which he will not receive. Many contractors work on the theory that the best defense is a good offensive; therefore, when a carelessly compiled set of specifications and a poor set of plans are encountered, these contractors will take the aggressive to protect their interests, generally with considerable success, so that again the owner will pay for many things which he will not receive.

The architect's position in the modern business structure is sound and conforms to the established economic theory that design, plan and supervision should be detached from that of execution. The architect's position can be maintained only while he works in conformity with this economic principle, which should result in the preparation of carefully compiled specifications and accurately detailed plans, so that the contractor will confine his energy to execution only and will not invade the architect's and engineer's sphere of design and selection of materials. The success of a project will depend generally upon a logical plan and a scientific and business-like selection of materials, with the element of cost balanced against desirability for the purpose. The cost of a product should include the initial cost plus the cost of maintenance. The money spent in the construction of a building becomes an item of overhead which will be chargeable to the taxpayer, tenant, merchant or manufacturer, depending upon whether the building is for public use, tenant use, sales, or manufacturing purposes. Successful business executives are constantly striving to legitimately reduce overhead, for the reason that this charge must be added to the price of the commodity which will be manufactured or sold. If this overhead charge is excessive, it will impose a handicap on the commodity when in price competition with one which enjoys an overhead charge of lesser amount. This economic theory is not inconsistent with good architectural design, because it conforms exactly to the theory that good architecture should accurately express the purpose for which the building was constructed. Our modern architectual design at its best recognizes this theory, and is producing truly American architecture which accurately expresses the spirit of the age and the purposes for which buildings are constructed. A specification carefully compiled will take into consideration each and every angle from which the building can be appraised, so as to cover and include all contingencies. A specification so compiled will earn the respect of all affected and will form an instrument used as a means of trade and agreement to the end that all affected will enjoy its protection. This type of specification definitely establishes the liabilities of each individual affected, to the end that the operation will proceed smoothly to completion to the satisfaction of all concerned. This should be the ideal of all specification writers.

The most desirable material for a given purpose is frequently not the most expensive material. The familiar expressions: "Do not use nickel-plated lath," and "Do not gold-plate the job," express the thought. If the market is carefully investigated, there will be revealed the fact that considerable sums of money can be saved without injuring the character of the work in any respect, and in fact often improving it. Buildings in which expensive materials are used in service and storage portions are victimized generally by carelessly compiled specifications with the familiar clauses: "All trim shall be mahogany"; "All floors shall be terrazzo"; "All

balustrades shall be bronze as per detail"; and similar clauses which the supervisor interpreted exactly as written, irrespective of the location. The value in quality and money between the different grades of a given material should always be kept in mind, as very often the difference in price between the different grades is out of all relation to the difference in quality between them. This condition is due largely to the specification writer's requiring the very best grade of a given material in almost all instances, which results in a demand which causes a premium to be placed on the particular grade, while a slightly inferior grade, perfectly suitable for the purpose, will clutter the market. As an example, the difference in price between "A" dense heart rift yellow pine flooring and "B and better" dense heart rift yellow pine flooring, is out of all relation to the price difference between them. The price difference between "AA" quality window glass and "A" quality is out of all relation to the quality difference. A light of double thick "AA" quality window glass, 24 inches by 30 inches, has been quoted at $1.56 at warehouse, New York. A light of "A" quality glass has been quoted at $1.05. The difference in quality between these two grades of glass is so slight that it cannot be established by the average supervisor of construction. Expert graders of glass will not agree on more than 70 per cent of the "AA" quality glass. "A" dense heart rift long leaf yellow pine flooring 13/16 of an inch thick, has been quoted in the metropolitan territory at $130 per thousand. "B and better" dense heart rift yellow pine flooring has been quoted at $110 per thousand. These prices cover flooring delivered at the site. There is very little difference between these two grades, as "B and better" flooring contains 50 per cent of the "A" quality. Therefore, in ordinary cases the "B and better" would be the logical flooring to use, as the differences are of such a nature that they cannot be detected except by an expert. Similar and more exaggerated examples could be given at length.

When considering the item of cost, it is well to bear in mind that the difference in prices of raw materials will not bear the same relation when incorporated within the bulding. Let us consider an ornamental metal grille. The price difference between rough cast bronze and cast iron is about 10 to 1, whereas the price difference between the same grille in cast iron and bronze would be about 4 to 1, the proportion being cut down for the reason that the cost of the models and patterns would be the same in either case. It is possible to design an ornamental metal grille so that the cost of the model and pattern, coupled with the item of breakage for cast iron, would be so great as to compensate for the price difference between the metals. These examples are given to illustrate the proportional differences in cost between materials delivered at the site and the same materials incorporated within the building.

Example. Wrought iron pipe will cost approximately 40 per cent more than steel pipe. The cost of the pipe material for a plumbing system on an 11-story office building was 25 per cent of the cost of the entire piping system, exclusive of the finished plumbing fixtures, which reduced the percentage cost of the wrought iron pipe over steel pipe to 7 per cent in place, the percentage of additional cost being reduced for the reason that the items of labor, valves, pipe covering, painting and similar work were the same in either case.

Example. A light of double thick "B" quality window glass, 14 inches by 18 inches, will cost about 20 cents at the warehouse. A light of ⅛-inch or ¼-inch polished plate glass of the same size will cost about 52 cents at the warehouse, which is 160 per cent more than the double thick "B" quality glass. It will cost approximately 20 cents to glaze either light of glass, or 40 cents for the "B" quality and 72 cents for the plate glass, a price difference of 80 per cent between them.

Example. Strip copper in sheets is worth 25 cents per square foot based on 16-ounce copper. Galvanized iron is worth 5½ cents per square foot in sheets, which is less than one-fourth of the cost of the copper. Plain copper cornice or moulded work will cost approximately 65 cents per square foot in place. The same work in galvanized iron painted would cost approximately 40 cents a square foot,—about two-thirds of the cost of the copper work.

When other materials are involved it will frequently be found that the cost differences between the two classes of work will not be anywhere nearly as great as if the other materials were not involved. For instance, galvanized iron skylights are quoted at approximately $1.20 per square foot, whereas copper skylights are quoted at approximately $1.70 a square foot. In this case the difference between them will be reduced, due to the fact that the other materials, such as, glass, puttying, labor, painting, etc., are the same in either case. For this reason galvanized iron skylights, except for highly speculative work, is a poor buy. The specification writer should investigate very carefully the element of cost, as it affects all substituted or sub-standard materials. He should carefully analyze and check all statements made in relation to the ultimate costs of these materials. I am quite familiar with more than one case where substituted and sub-standard material will cost in place as much as the standard material which they were designed to replace. When asking for prices, the price quoted will very often be f. o. b. factory, when it is customary to quote the same material in place. The price will often be quoted so as not to include some essential item of finish which will materially increase the price.

The materials used in the constructoin of a building can be roughly divided into two portions,—one raw materials, and the other manufactured materials. Raw materials, which comprise generally wood and stone in their multitude of sub-divisions, are products of nature, and as such are not subject to adulteration or alteration in quality, except such as

will occur during growth or formation. The specification writer and the supervisor of construction should be thoroughly familiar with the various kinds and grades of these materials and their adaptabilities for different purposes; for this reason it is unimportant from whom these materials are purchased. Steel, cement, copper and tin may also be classed under this heading, for the reason that their quality is stabilized by the equipment and resources behind them. When specifying manufactured materials, a different condition occurs, for the reason that the processes of manufacture are technical, and it is difficult to establish the quality of a given material without laboratory tests. When called upon to specify paints, asphalts, waterproofing compounds, mastic and rubber flooring, etc., it is better to spend energy investigating the manufacturers and to select one of recognized standing and integrity and then let him take care of the responsibility for the success of the material. Questioning whether it were possible to determine the quality of two kinds of rubber tile outside of a laboratory, I consulted with three experts on rubber and two purchasing agents, and they all agreed that it was not possible to establish the quality of the two rubber floor tile outside of a laboratory, despite the fact that there is a 60 per cent price difference between them. The company behind products of this nature is of more importance than the product itself. To prevent any question in the estimator's mind as to whether the material specified is the proper material for the purpose, it is important that proper selection be made, so that the product and grade will be logical for the purpose.

To bring out the various questions which should be answered before selecting a given material, these examples are given:

Brick Work. There are two basic types of brick, —common brick and face brick. Common brick has been defined as a "moulded solid unit of burned clay, the standard size of which is 2¼ by 8 inches, not specially treated to produce either color or texture." Face brick can be defined as "a solid unit of burned clay specially treated to produce either color or texture." This treatment may consist of varying the process of manufacture, such as scoring the face or repressing the brick. It can also be obtained by different burning methods or by adding substances to the clay to produce special color effects. The grading of common brick varies with the locality. In the metropolitan district, which consists of New York and adjacent territory, bricks are graded as: Light Hard or Salmon Brick; Hard Burned Hudson River Common Brick; and Lammy or Arch Brick. Light Hard or Salmon Brick are brick somewhat underburned and of lighter color than the regular run, but are sufficiently strong for ordinary use, except that they will not stand exposure to the weather. Hard Burned Hudson River Common Brick are the standard brick normally sold, and upon which all market quotations are based. Lammy or Arch Brick are the overburned brick which are often darker in color than the regular run, and are usually misshapen, varying from a slight degree to what are sometimes called "swelled" or "burst" brick. Physically, these brick are equal to the standard brick, except that their shape is distorted, and their use is usually confined to the exterior facing of the building to obtain architectural effects. The demand for these bricks often causes a premium to be placed on them.

Probably the best known common brick is the "Harvard" brick, so called because of its extensive use in the buildings of that university. Harvard brick is a New England common brick, and is a moulded open-yard, water-struck, wood-burned brick, sorted for color and handled with tongs. There is a definite trend back to use of common brick for facing purposes, due to the various architectural effects which are possible with the use of the different grades of common brick. Face brick, as we now know it, is a comparatively modern product, and does not possess the architectural background that common brick possesses, and it is not as economical, either in the cost of the brick itself or in the cost of laying. Many effects can be obtained with common brick by the use of the different bonds of brickwork and the use of different jointing. Instead of using special headers for effect, the heads can be broken off, which will cause a difference of texture and color with the stretcher brick. Investigation will reveal many other effects possible with common brick which will reduce the cost of the work materially.

Face brick is manufactured in various colors and textural effects, and in addition it will vary considerably in physical properties. The specification writer should look carefully into the cost of laying the different types of face brick, as those which have a very low rate of absorption are what a brick layer calls "floaters," and will cost considerably more to lay than brick with a relatively high rate of absorption. It is now becoming generally known that a brick with fair absorptive qualities will help produce a dry wall, due to the fact that it will bond better to the mortar and that the water will mushroom across the face of the brick and allow the heat and sun to absorb the moisture through the brick, whereas a brick of low absorptive value will not bond well to the mortar, and the water will find its way through the mortar joint into the interior, as it cannot be absorbed through the brick. The best grade of face brick is generally selected for color and mechanical properties, brick of one shade and perfect mechanical properties being the most expensive. This class of brick is often desirable for the interior of a building, but it should be used rarely for the exterior facings, due to the fact that it is not considered proper to produce a dead wall of one shade. Also a brick of perfect mechanical properties leaves much to be desired in the texture and general effect of the wall surfaces. With these considerations in mind, much can be saved in the selection of the face brick.

In laying brick, the character of brickwork has considerable to do with the cost of the finished work.

Face brick laid from an outside scaffolding is very much more expensive than brick laid from an inside scaffold, or "overhand brickwork" as it is known in the trade. Face brick should always be laid from outside scaffolds, for the reason that the mason can see what he is doing and can judge the effect of his work. When laying the brick from the inside of the wall, the mason cannot see whether the joints are plumb or not, nor can he judge the effect of the work he is doing. The estimator for brick work is interested to know whether all the headers used in Flemish, English, Dutch or cross bond will be through headers, or whether every third or fourth header will be a through header. It is customary to have the same number of headers in this class of work as would be used in common brickwork, with every sixth course a full header bonded to the backing. Care should be used to carefully specify all special angle brick, ground brick or moulded brick, and exactly where they will occur; if not, the contractor will assume that standard brick clipped on the site will be used for these purposes.

The cost of the different classes of common brick will vary considerably in the locality in which the brick is purchased. It will also vary considerably depending upon the demand for the particular kind of brick. At the present moment in the neighborhood of Newark, Lammy or Arch Brick have been quoted as high as $40 per thousand, when the standard Hard River Brick were being quoted at $18 per thousand delivered at site. The difference in cost of the various classes of common brick is so variable that it should be obtained from local dealers in the different localities. There are some sections of the country where common brick are not selected but are delivered as kiln run, which is just as they come from the kiln without any selection at all. The New England Brick Manufacturers' Association are grading their brick now as Merchantable Brick, consisting of 50 per cent suitable for facing and 50 per cent suitable for backing; Common Face Brick, consisting of brick from the body of the kiln suitable for facing; Selected Common Face Brick, consisting of brick specially selected to meet architects' specifications; and backers, which consist of all brick suitable for backing-up purposes. The grading went into effect January 1, 1928. Face brick will vary considerably in price and to such an extent that it is almost impossible to furnish any definite price data in relation to them. It is, therefore, important that the specification writer consult with the local face brick dealer for information in connection with the prices on face brick.

Cut Stone. There are various types and grades of stone used for building purposes. The type and kind of stone will vary somewhat in the locality in which the stone will be used. Limestone is used to a far greater extent than any other stone for building purposes, and for this reason it will be used as an example of some of the considerations which should be given to the question of cut stone when specifying. There are various grades of limestone. The standard grades are: Select Buff, Select Gray, Standard Buff, Standard Gray, and Variegated. The cost of limestone will vary according to the grade specified, the first named being the most expensive and the other grades in the order listed. There are also some special grades of limestone where unusual veins of stone are encountered in the quarry. A very hard grade of limestone is also quarried, which is suitable for door sills and exterior steps. It is well to keep in touch with the local stone yards so as to be familiar with the price variations between the different grades. All of the grades mentioned, with the exception of the hard limestone, have about the same physical properties, so that the selection of the particular stone for a given purpose should be for effect desired and not on a price basis, unless price is the dominant factor. Variegated stone has been used with considerable success for buildings of Gothic architecture, whereas select buff is more suitable for Classic architecture.

Here is a price list on the different grades of Indiana limestone, and is the cost per cubic foot of the stone in blocks, f. o. b. cars New York:

Grade of Stone	*Scabbled*
Statuary Buff	$1.92
Select Buff	1.67
Standard Buff	1.57
Coarse Buff	1.42
Rustic Buff	1.42
Select Gray	1.57
Standard Gray	1.47
Coarse Gray	1.32
Variegated	1.47
Old Gothic	1.32

Contractors in the metropolitan territory are estimating limestone at about $5.25 per cubic foot for ashlar work and approximately $5.50 for plain moulded work. This will give some idea of the relation that the cost of the stone delivered will have to the cost of the stone in place. The finish of limestone has a bearing on the cost. Stone used just as it comes from the saw or planer is the least expensive, while special hand-tooled effects are the most expensive. Between these two extremes there are many desirable finishes, such as shot sawed; tooled; planer finished, with the edge of the tool broken to create the effect of hand-tooled work when set. Various finishes can be used upon the same building with good effect. About 30 years ago, prior to the general use of machinery for finishing and sawing stone, this work was almost always done by hand, and machine-cut stone was not considered the proper thing among the architects of the day. It was during this period and earlier that rusticated ashlar was in vogue. This type of work would be extremely expensive today, because it would have to be hand-finished after it was sawed, unless there were enough scrap around the quarry to supply the particular demand. When specifying cut stone, it is important

to specify who will furnish the anchors. It is also important to specify the thickness of the ashlar and whether the ashlar will be back-checked at the columns, window jambs and corners, or whether the 4-inch ends of the ashlar can show at these points. When electric or other outlets occur on columns, it is important to indicate these on the details and specify that these should be cut or drilled by the stone contractor, which can easily be done at the shop. If these outlets have to be drilled at the site, considerable expense will result.

Carpentry and Mill Work. An investigation should be made of the kinds and grades of timber which are used locally. Wood used extensively in certain localities will be cheaper than in localities where it is not stocked. Along the eastern Atlantic sections, particularly along the shipping points, there is a considerable quantity of Douglas fir timber. In other localities yellow pine will be in demand. Care should be taken that the proper and exact grade for a given purpose is specified and that this grade be according to recognized established grading rules. These rules should be investigated so that the proper grade be selected for a given purpose. The difference in price between Prime long leaf dense yellow pine and Select Structural dense long leaf yellow pine is out of all relation to the quality difference between them. Ninety-nine per cent of Prime would grade as Select Structural. When specifying yellow pine, it is well to specify the locality in which the timber shall be cut. For instance, very little virgin growth yellow pine is cut in the eastern states, with the exception of a small portion of Florida. By far the best pine comes from Mississippi, Louisiana or Texas. The quality difference between this lumber and the second growth lumber in the eastern states may make it well worth while to specify the western lumber, as this is virgin timber having a slower growth, and therefore it is more dense in structure.

The lumber industry maintains what is known as "inspection service," by which at a slight fee the lumber delivered can be re-inspected so that the architect may be sure that the lumber delivered is what is specified. In case of dispute as to the grade of lumber delivered, it is customary to require an inspection, in which case the loser generally pays the cost, which is in the neighborhood of 50 cents a 1000 board feet. Many architects are unfamiliar with the standard sizes of rough lumber as it comes from the saw mills, and do not seem to have a clear idea of the sizes it will be after it is kiln dried and finished ready for the building. Lumber for millwork is sold by the inch, and the price quoted will be per 100 lineal feet, so that when quoting $1.50 an inch for a particular kind of wood, that means $1.50 per square inch of cross section of stock from which the moulding will be cut per 100 lineal feet, and not the cross section of the actual size of the moulding. Therefore, it is very important for the detailer and specification writer to bear in mind standard sizes of finished lumber, which are about as given here.

Rough lumber will be sawed in the mill to the thickness of 5/8 inch, 3/4 inch, 1 inch, 1½ inches, 2 inches, 2½ inches, 3 inches, 4 inches, 6 inches, and in 2-inch units for thicknesses thereafter. The widths will be in units of from 2 inches up to 14 inches, the narrow boards being more numerous than the wide boards. Lengths in lumber will run in even feet from 6 up to 16 feet, though more 8-, 10- and 12-foot lengths can be had than the 14- and 16-foot lengths. The thicknesses of the lumber quoted are in the rough stock as shown. These thicknesses will shrink or work off in the manufacture, so that 1-inch lumber will finish approximately 13/16 inch thick; 2-inch lumber 1¾ inches thick; and 2½ inches thick will be worked from thicker lumber. The shrinkage in width will vary with the different woods, so that when a 7/8-inch moulding is detailed it will require a 1¼-inch stock to produce it. Sash in doors are 1⅜ inches, 1¾ inches, 2¼ inches and 2¾ inches thick. If large quantities of a given moulding are required, it will cost no more to have this moulding detailed and specially run than to use a stock pattern. But if a small quantity of a given moulding is required, it is much better to use a stock pattern in order to save the set-up charges.

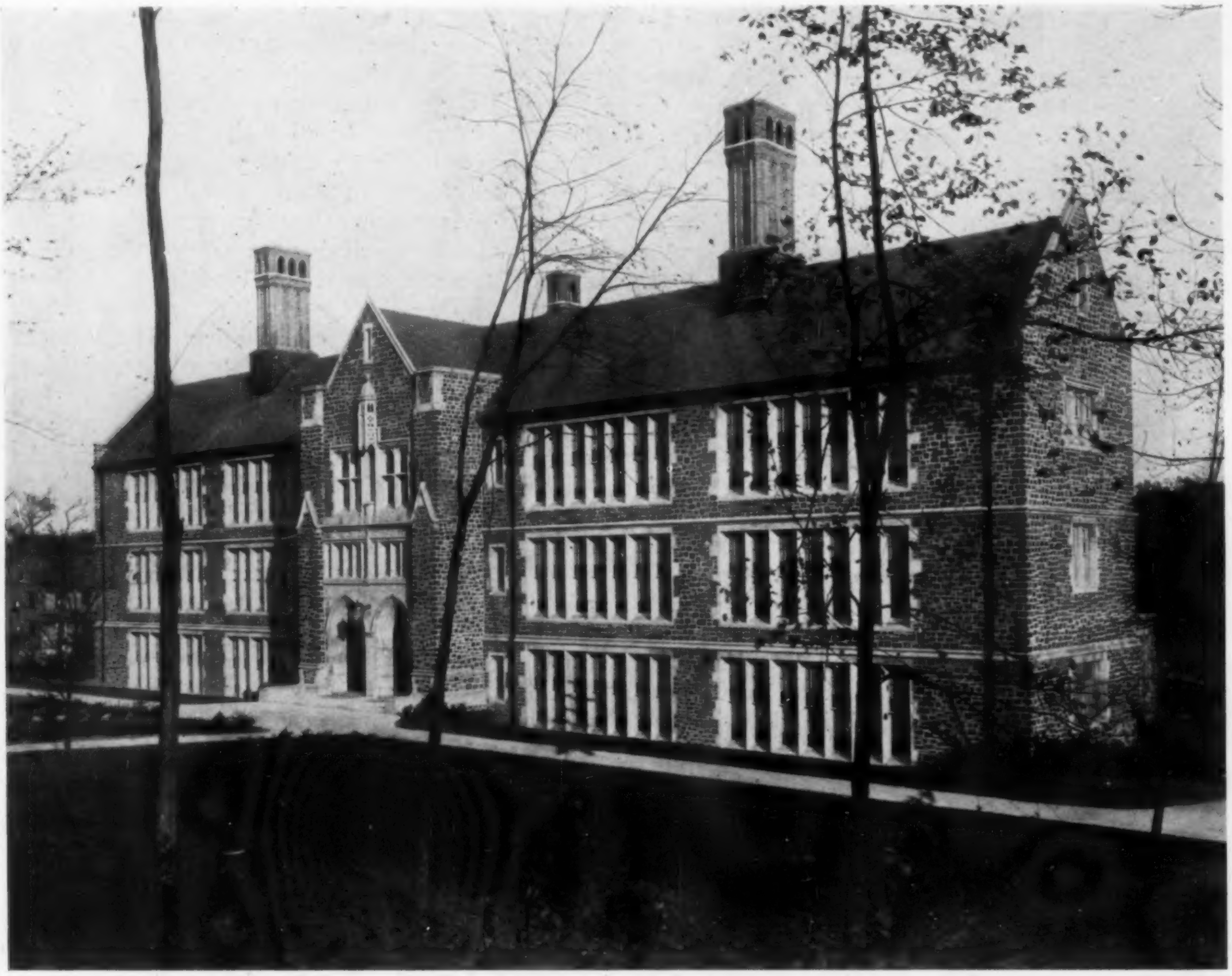
It is unwise to specify that window boxes will be made of clear white pine or cypress throughout, with Georgia pine pulley stiles and parting strips. Such a frame would be a waste of money, the requirement being that the sills, outside mouldings and exposed portions of the box be of white pine; the pulley stiles and parting beads being yellow pine, and the rest of the frame of good, sound, merchantable lumber free from large, loose knots, shakes or similar defects. In specifying the size of the pulleys, it is well to get a sample and lay it over the detail and see whether the center of the sash cord will actually fall in the center of the box. If the pulley is too large or too small, the weight will drag against either side of the boxed frame. I find very few draftsmen who pay any attention to this when detailing. Window frames and sash should always be detailed. Few stock frames and sash are made that are really substantially built and weatherproof. By detailing them, a greater variety of sizes can be obtained as well as a stronger and better frame and sash.

The exact character of interior finish should be clearly specified. The types generally required are: "Straight Mill Run Job," which consists of the trim being delivered in lengths and then put together at the site; a "Made Up Job," which consists of the door jambs, window and door trim, mantels and similar work built complete in the shop and delivered ready to set in place in one unit; a "Mill Cabinet Job," which requires the assembling of fine grade veneering, trim, wainscots, etc., in the mill, building up in complete units, and delivering it at the site where the carpenter sets it up and the painter finishes it; a "Strictly Cabinet Job," which requires the complete construction of all of the woodwork in the

shop of the cabinet maker. It also covers the building up of the special veneerings which are required to produce the effect desired.

When a fine cabinet project is encountered, it is always well to select the exact flitches of the wood beforehand from a reputable hardwood dealer. These woods are then filed in the architect's office and are referred to by name, grade and sample, so that the cabinet maker will know exactly the type and kind of wood to estimate upon. It is particularly important to take care of this item in rare woods, for the reason that there is a great difference of opinion as to what might be required. For instance, when specifying English Oak the question is whether oak from England is required, in which case a tree is selected in which the sap has stopped running and which is about dead. Wood of this type costs considerably more than what is known as Commercial English Oak, and this same principle rules in more or less degree with all types of hardwood. It is, therefore, important to consult with a hardwood broker and select the exact wood wanted for this type of work, and to obtain comparative prices.

Summary. An attempt has here been made by means of a few examples to give some idea of the different conditions which must be considered before the preparation of a specification for a given trade. The examples by no means cover all of the considerations. They are merely intended to give some idea of the procedure required to establish just what should be used for a given purpose. The specification writer should carefully consider the far-reaching effects of his specifications and should remember that the element of cost can never be disregarded but that it affects the earnings not only of the developer of the project, but the multitude of people in all walks of life who invest in modern mortgage bonds. It also affects the tax-payers in various communities where public buildings are being built. To keep faith with these people and at the same time to erect proper buildings, calls for the very best and for all of the efforts that an architect has at his command. This responsibility must be met and should not be shirked, for if the architect does not rise to leadership and assume this responsibility, it will be assumed by others not as capably trained or as well fitted for the work, to the end that the control of specifying will gradually pass out of the hands of the architect, which will seriously affect the practice of architecture in America.



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